

Australian Model Engineering

September-October
1995

Issue 62

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LOCOMOTIVES, TRACTION & STATIONARY ENGINES, BOATS,
WORKSHOP, PRODUCTS, CLUB NEWS & EVENTS, REVIEWS

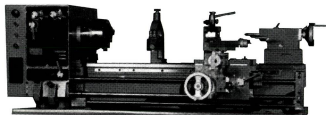
In This Issue: ☒ A 4½" scale Allchin Traction Engine
☒ Build a Simple Marine Steam Engine
☒ Tips on Sand Cast Metal Founding



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Issue 62

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The Cover

Peter Smith's magnificent 4½" scale Allchin traction engine. Peter's farm is an ideal backdrop for this scene. You can see this engine and many others "in-the-flesh" at Inverell, 21 and 22 October. The story starts on page 9.

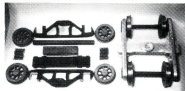
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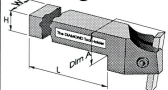
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Comment

A Call for More Realism!

I am sure that many others, besides myself, in the ground-level railway branch of our model engineering hobby are enthralled by the total railway scene. Where interest is held, not just in locomotives alone, but in the trackwork and other civil works such as bridges and buildings, in signalling and rolling stock, in payloads and our almost endless list of other railwayana.

I have always had a penchant for models. As a boy; toys like trucks, cars, boats, tanks and trains were high on the priority list. But, as I grew older, trains came to the fore.

We all seem to go to great pains in the authentic reproduction of detail on our miniature locomotives, but, very few of us give much — if any — thought or effort to the rest of the railway atmosphere.

Some clubs have gone to considerable effort to capture the realism in their facilities. The roundhouse at Moorabbin, the signal cabin and amenities block at Blaxland and the deep cutting and wig-wag signal at Galston are excellent examples to name but a few. However, many others have created structures that pose as stations, bridges and signals etc. which can only be described as grotesque.

To see the delight on childrens' faces when they are confronted with a miniature wonderland of scaled down buildings, fences and rolling stock is often a joy worthy of the effort put into its creation, not to mention the joy to be had from indulging in that little bit of childhood that must still be in those of us who like to play with trains.

Many do not have the flair or indeed inclination to create anything other than a miniature working locomotive. I do not knock them for this, as ours is a hobby with room for all, even the armchair modellers! Conversely, there must be many more who are only held back by peer pressure or by not knowing quite where to begin in this creative activity.

I well realise that we cannot make a station building to 1/8th or 1/12th scale on a railway which carries a full size engine driver and passengers. However, we can drop the ceiling height below eight feet, use typical railway style small pane multi panel windows, frieze decorate awnings, fit finials to the peak of roof hips and substitute small white pickets for the dreadful roll top weldmesh fencing.

The best way to start on such a project is to study photographs of typical prototypes, then concentrate on reproduction of the characteristic features, keeping everything down in size, yet still balanced in proportion (the HO modellers are masters at this practice which they refer to as "selective compression" ... ed)

So how about it! Next time your club is going to build an item such as a turntable, don't just make it out of a bit of channel fixed to an upturned truck differential. Sit down one night in your armchair with a bundle of railway books and notepad. Sketch up a *real* turntable, made from steel plate and angles, with plenty of rivets. Dummy rivets will do as they simply be dimples pressed in from the back, or rivets poked through holes from the front, and then tack welded our of site from the rear.

The end result of which you can be proud, has far more appeal and certainly is something far closer to true model engineering!

Bob White



To our new reader

If this is your first issue of Australian Model Engineering, welcome! We hope you'll look forward to the ideas, news and camaraderie in each bi-monthly issue.

One of the great things about our hobby is the way model engineers actively help each other. Unless you live in an isolated community, you'll soon discover who has valuable experience in your field of interest, or who will help you to make a part that's too big for your workshop machinery. Look in the *Club Roundup* section to find a club that's near to you; pay a visit and you'll usually find model engineers who live not too far away. Then you can experience the great fellowship that makes our hobby special.

This magazine is prepared in the same spirit of "model engineers helping each other". About two dozen people put many hundreds of hours work into each issue — all on a voluntary basis — to help model engineers in Australia and New Zealand keep up to date and stay in touch.

We rely on our readers to write articles for us — for the same (non-existent) rate of pay! If you have ideas or techniques that you feel would be interesting to others, please drop us a line. We'll gladly help with preparation of artwork or editing if that's necessary. Most important of all, please support the people who advertise in our magazine. Without them to pay the bills, you wouldn't be reading this!

Brian Carter

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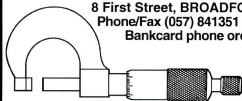
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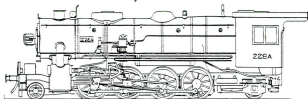
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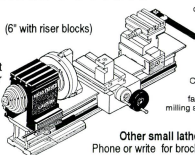
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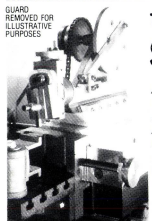
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The Allchin in 4½" Scale

Story and photos by Peter Smith

The urge to build a miniature traction engine began back in 1973 at the AALS convention at Millswood in Adelaide. I was shown a pair of front wheels, axle and a spud pan for a 3" scale Allchin. I had to see more, so on the Sunday morning I went to view the rest of this Allchin. I was very impressed with what I saw, so later that year the Allchin project began.

As smitten as I was, the project never got very far. I wasn't completely satisfied about the size of this engine — I wanted something a little different. I put the Allchin project on hold and returned to building loco's a little while later another 7¼" narrow gauge loco left the workshop.

Late in 1982, the Allchin drawings were brought out of the cupboard again, I spent many hours looking over them. The Allchin looks like a good, a well balanced engine — not ungainly. A discussion with John Hartley resulted in a decision to build two Allchins in 4½" scale, and share the cost of patterns, etc.

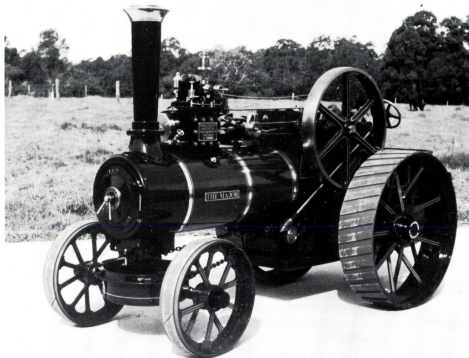
The wheels

We decided to tackle the wheels first as they are not easy to build and a good job to get done first. The front rims were rolled in a home made set of rollers, however, 89mm x 10mm (3½" x ¾") flat bar rolled to 406mm (16") dia. proved to be a six pack job for each rim.

The tee rings were oxy-cut from 6mm (¼") plate machined and welded into the rims with staggered welds. Spokes were oxy-cut oversize using a tin template. They were then milled in batches to the final profile. The hub is made in three pieces as for the 1½" scale Allchin. 6mm (¼") dia. round-head rivets were used in the fabrication. After drilling and bolting the wheels together, the rivets were formed over using the oxy torch to bring them to red heat. The steel tyres were rolled and cut on the angle and riveted to the rims. Fitting the spokes, after bending, to the hub must be done very carefully. Use a feeler gauge to ensure the spoke base sits flat in the milled groove. This applies even more so with the rear wheels. The spokes should not be under tension, both at the hub and the rim, before riveting takes place. This ensures that your wheels run true. The larger the wheel the more this applies.

The rear hubs were made as per the drawing using four castings for each. The grooves were milled with the aid of a rotary table and spokes made the same way as for the front wheels. The tee rings for each wheel are again cut from 6mm (¼") plate. The rims rolled in pairs and joined together with staggered tack welds, using as little weld metal as possible to avoid distortion.

Strakes were simply cut and twisted in the vice to a trial and error method to get them to



Peter Smith's magnificent 4½" scale Allchin traction engine — The Major.

sit flat on the wheel at the required angle. Once the first few were right, the rest were easy. Assembly was carried out on a fabricated jig to locate the hub and rim with the different offsets for right-hand and left-hand wheels. They were drilled, bolted and riveted, working diagonally opposite around the wheel. Prior to painting, all wheels were sand-

blasted and primed.

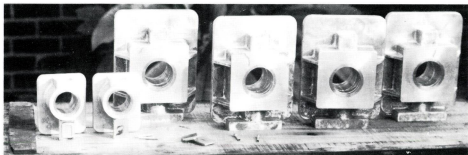
The front axle was made, and castings for the fore-carriage fork were machined. Leaf springs were specially made for us by a spring maker. The spud pan was fabricated to complete the front axle assembly.



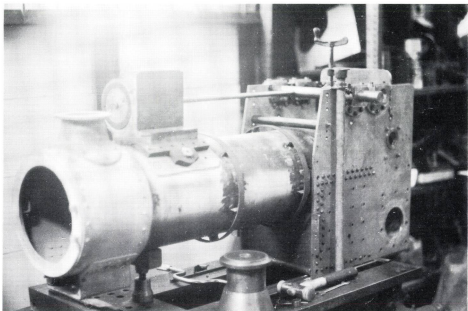
A collection of Allchin parts



Peter Smith (left) and John Hartley (right) flanging the tender sides.



The two smaller housings on the left are for the third shaft.
The four larger housings are for the axle.



Lining up the hornplates

Boiler

The boiler is a standard steel Briggs stayless type, with a firebox circulation pipe from the bottom of the barrel to the crown sheet. The welding was done by Kevin Bruderlin — well known for his boiler expertise and articles in AME. The firebox assembly has to be made accurately because the hornplates are bolted through the sides with spacers in-between.

The boiler/firebox was assembled on a dead-flat surface to ensure alignment. A pad was welded to the top of the boiler to thicken this area for cylinder mounting.

Cylinder

The valve face was machined first to give a flat surface for mounting the cylinder to machine the bore and saddle in one operation using a heavy boring bar between centres. The

Allchin style trunk guide was cast in grey iron, using a pattern and complex core boxes to produce a one-piece casting.

Hornplates

Hornplates form the main chassis of the

traction engine. Spacers were made to the exact inner width and after drilling all holes, the hornplates were bolted together. The bearing housings were set up in-situ and the alignment was checked before offering up the firebox sides. The cylinder, which was partly machined and bored, was positioned on the boiler and a dummy piston and guide, with a long piston rod fitted, was used to align the hornplates. Drilling buttons were placed in each wall stay and drilled through the firebox sides. Spacers were individually fitted to each bolt between the firebox and hornplate.

Crankshaft

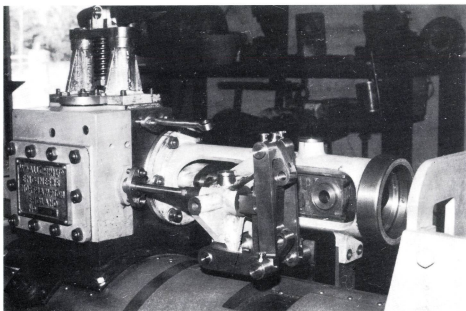
The crankshaft was oxy-cut from 32mm (1¼") plate then straightened, roughly shaped with the angle grinder and machined oversize. The crank journal was cylindrically ground to finished size.

Differential

The diff is chain driven from the third shaft, with an idler sprocket to take up slack when reversing. Bevel wheels and pinions were cast from a machined aluminium pattern.

Valve gear

The valve gear as drawn was not quite right. However, after laying out the gear to design it seemed reasonable, so it was made up and fitted. The expansion link swing was



The Allchin cylinder block with part of the valve gear attached. If you are following the Steam Chest crosshead series, the Allchin has a trunk guide type.

found to be excessive and uneven. This was due to the suspension location of the link, with the lifting pin at the top of the link and on the same centre line as the die block. With hindsight, I would reduce the eccentric throw and alter the valve length to suit. This would not give a full port opening with the existing port layout but should give a more even cut off.

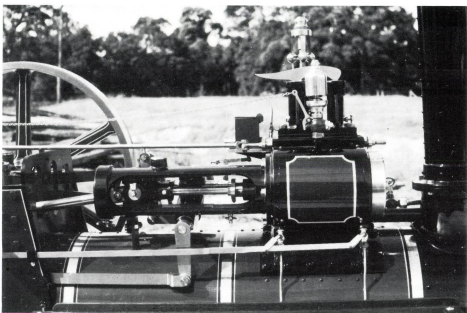
I believe some full size traction engines were arranged this way. Sometime in the future I intend to alter the valve gear as mentioned.

The tender

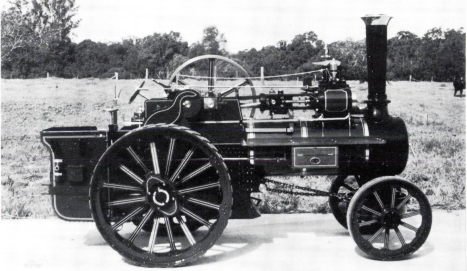
The tender is built from 4mm ($\frac{5}{32}$ ") plate, sandblasted and painted internally with Tar Epoxy. The sides were formed using two oxy heating burners over 25mm (1") thick steel formers. Rivets were set down hot with a snap made to fit an air chisel.

The painting of this engine has got to be the worst job I have ever tackled. Painting is not high on my list of things I like to do — I can never seem to get it right.

Murphy's law takes over the minute I open a can of paint. Paint lining was made a bit



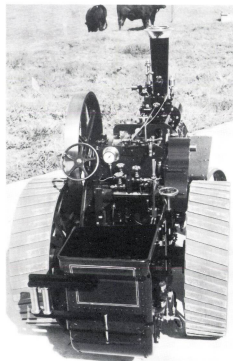
A closer view of the cylinder block and trunk guide.



Let's step back and have a good look at Peter's Allchin.



Peter Smith and the Allchin. Peter looks a bit too big to take advantage of the living van!



A driver's view of the Allchin — I hope the cowcatcher works. Oh! I forgot, traction engines don't have one!

You can see this engine plus many others at the 7th Australian Traction Engine Rally at Inverell NSW 21st & 22nd October

easier by the use of a wheeled paint liner and guides made up to suit. They have wheels for 0.4mm to 6mm (1/4" to 1/4") width lines. Once you get the paint consistency right and a steady hand, the result can be good, and quickly done.

Looking back I probably could have cut building time dramatically if I spent less time looking for things I just put down somewhere or on my knees looking among shavings on the floor for parts dropped.

The prototype story

The following is an extract from:

Hughes W.J. 1969, *Traction Engines Worth Modelling* David and Charles, Devon, UK.

"William Allchin of Northampton was one of the pioneers among traction engine builders, contemporary with Fowler of Leeds and Aveling of Rochester, though not perhaps as well known. His works were established in 1847, under the style of Allchin & Son, for the manufacture of portable engines, grinding mills, heavy saw engines and so on. The demand for the company's manufacture grew apace, and in 1876 they moved to new and larger works, under the name of Wm. Allchin, Engineers & Millwrights.

These works were further extended, and when William Allchin died, round the turn of the century, his family converted the business into a limited company, with a further change of style to Wm. Allchin, of Globe works, Northampton.

By now, of course, a large number of traction engines had been built, and in 1904 the firm turned its attention very successfully to steam wagons. These, too, were built in good numbers, and with them and the traction engines a large business had been built up, including many exports.

Model dimensions

Weight: 762kg (15cwt)

Width: 914mm (36")

Length: 1981mm (78")

Height: 1270mm (50")

Rear wheel:
685.8mm dia. x 171.5mm (27" dia. x 6 3/4")

Front wheel:
422.3mm dia. x 85.7mm (16 1/2" dia x 3 3/8")

Bore x Stroke:
82.55mm x 114.3mm (3 1/4" x 4 1/2")

Flywheel: 508mm (20" dia.)

Number of speeds: 2

Steel Briggs Boiler:
254mm dia. x 965mm (10" dia x 38")

Tubes — copper 20 x 25mm dia. (1")

Working pressure: 689.5kPa (100 psi)

Winch cable:
18.3m x 4.8mm (20 yds x 3/16")

Colour: crimson, vermillion and black.

The reputation of the firm for workmanship and high-class machinery was always of the best, and it was unfortunate that, owing partly to lack of new blood and partly to financial difficulties (not uncommon to the period), the firm had to close down in 1930. But many of their fine machines survived them, and even today a few examples are to be seen in preservation."



More Andy Ints

by Ross Edmondson

Gaskets

A friend telephoned recently in 'dire straights' wondering how to get holes in the right place in paper gaskets, he even went as far as buying some bad punches. When I showed him the easy method he just stood and looked in awe and amazement. After asking several model engineers and getting some weird and wonderful answers, here is the easy way!

Out of a piece of stout paper, cut out the desired shape of your gasket and put it in place. With the aid of one of your 'junior' hammers and an old ball bearing slightly larger than the holes in your job, hold the gasket with one hand and, with the ball bearing, make an indentation in the paper over the hole. The ball bearing should just sit there and with the aid of the 'junior' hammer give it a light tap and 'hey presto' a perfect hole right where you wanted it! Put a bolt into this hole

to hold the gasket in place and slowly work your way around the job. With a bit of practice you'll be amazed how easy it is.

N.B. Don't forget to put some sort of a pencil mark on the job where you started and also on the gasket, and mark which side faces in and which side faces out. At least if you drop it on the floor you'll know which side goes where! When fitting up, put a smear of grease on both sides of the gasket to hold in place and with a bit of luck — no problems!

The 'stout' paper for making the gaskets was once readily available from Woolworths, in the form of grocery bags. But alas, as we have all now turned to plastic, we have to find an alternative. Now it just so happens that the brown envelope that the subscriber's receive this magazine in is an excellent medium — but don't tell the publisher or he'll want to go and bump the price up!



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AUSTRALIA.

A Simple Marine Steam Engine

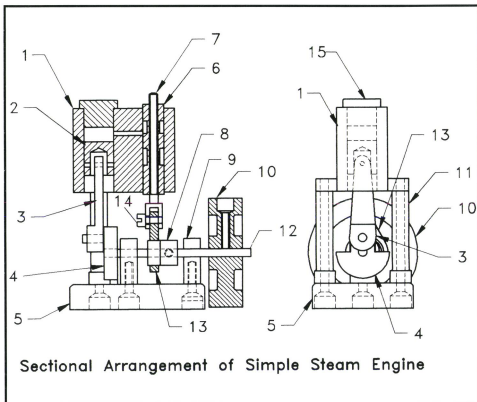
by Bill Carter

Drawings for publication by Peter Manning

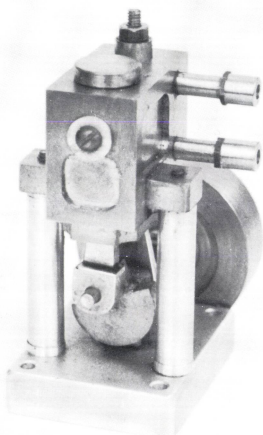
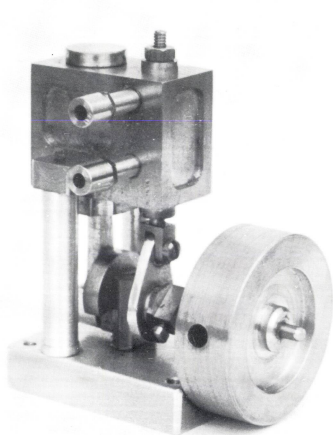
This small marine engine runs on the smell-of-an-oily-rag it's very economical on steam. It will easily power a 3ft x 6 inch fine-lined hull for 10 minutes on a couple of ounces of metho. The steam will need to exhaust up the chimney to get a metho lamp to burn well inside a closed superstructure. The fancy milling on the cylinder block was produced as a milling machine demonstration, it is not necessary for your engine.

There is nothing special about the design. It is not self starting, although a reversing mechanism using a slip eccentric would be easy to do. As it is a single acting engine, there is no critical distance between the valve lands. This means you can adjust how much lap, either positive or negative, you use for exhaust out or steam in, and the eccentric is only held by a grub screw so it can be set for any degree of advance.

Given some experiment on the length of the valve land (lap) it is possible to design for maximum power, or maximum efficiency. Feel free to experiment with any of the sizes shown and almost no alteration would be needed to increase the bore to $\frac{5}{8}$ " and/or stroke to $\frac{1}{2}$ ", this would more than double the capacity. If you enlarge the bore and stroke, I'd put the shaft up to $\frac{5}{32}$ " and gudgeon pin to



Sectional Arrangement of Simple Steam Engine



I use a reamer for the bore, if possible, it makes it easy. There is an advantage in making the valve bore the same as the cylinder bore, it just doesn't look as good. If you don't have access to a milling machine, it's a very simple job to do the cylinder block in a four jaw chuck, and pin and solder column lugs on later. I've even done small cylinders with lugs using a hacksaw and file!

Normally I'd solder in the steam, exhaust stubs and head, but I've left them loose in this instance so you can see how they are done.

The crankshaft is a press fit, shouldered down to $\frac{7}{16}$ " plus 0.005" interference. To press in without bending you will need a 2"

Flywheel

1/2" long x 15/8" diameter round brass,
although 1 1/2" dia would do.

5/32" BSW screw, head turned down to fit the hole.

13 $\frac{3}{8}$ " long x 15 $\frac{3}{8}$ " brass round (this would also come out of 11 $\frac{1}{2}$ " but columns would need to move back to the middle of the block)

2" x 1½" x 3⁄8" aluminium or brass
(as thin as 1⁄8" would do)

About 2" of 3/8" brass hex.

2" long x 1/2" bearing bronze.

1/8" stainless welding rod (316) is first choice although any steel would do.

2" long x 5/16" diameter steel.

1/16" dia. brass, 3/32" would be okay.

Turned from 1/8" BSW screw, the working part turned down to 3/32", or 1/16" if you're game!

7/16" of 3/8" round brass.

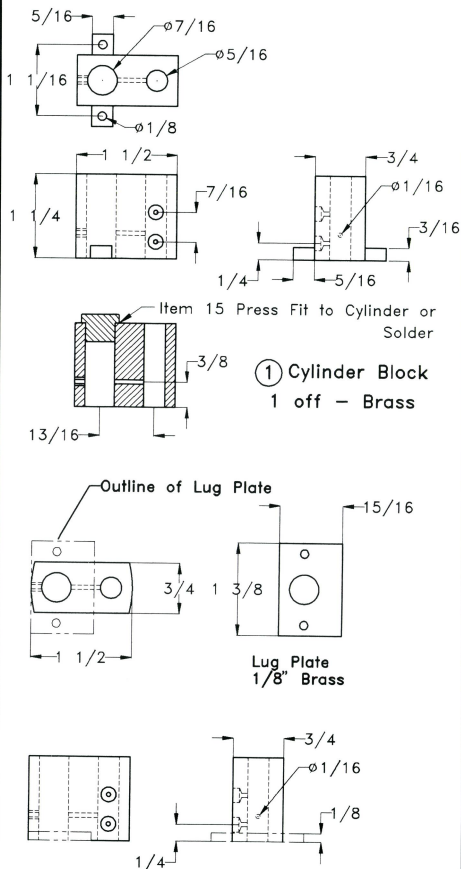
1½" of ½" round hard aluminium.

1" x 5/8" x 1/8" hard aluminium

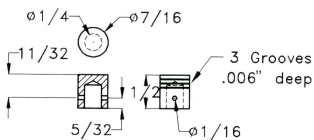
Eccentric grab screw
1/8" BSW brass screw with head turned down for appearance.

Machined from 1/4" brass rod.

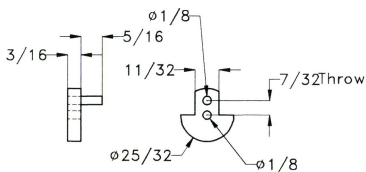
Clank web
Machined from head of 3/8" brass bolt.



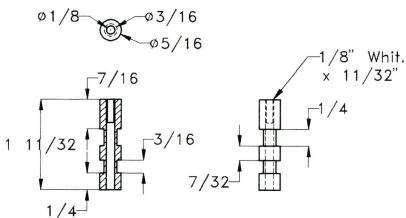
Alternative Cylinder Block
(Simplified Block)



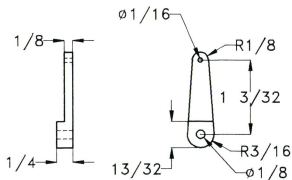
② Piston
1 off - Bronze



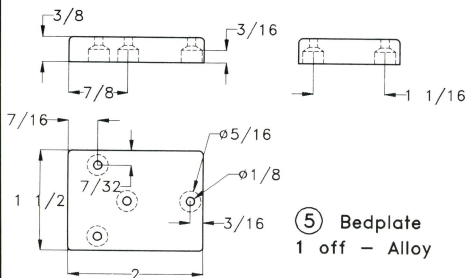
④ Crank Web
1 off - Brass



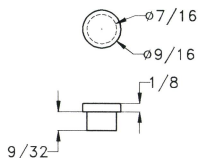
⑥ Valve
1 off - Bronze



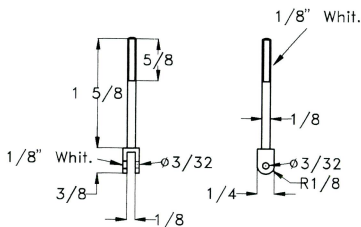
③ Connecting Rod
1 off - Alloy



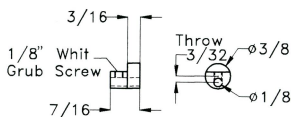
⑤ Bedplate
1 off - Alloy



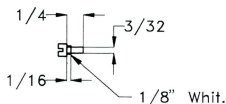
① Cylinder Cover
1 off - Brass



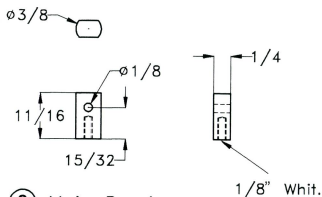
⑦ Valve Rod
1 off - Steel or Bronze



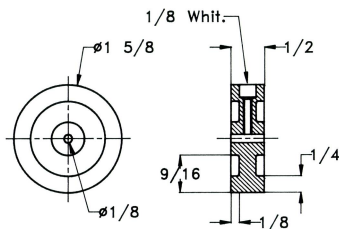
⑧ Eccentric
1 off - Steel



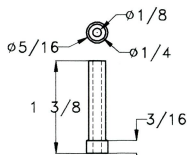
⑭ Valve Rod Pin



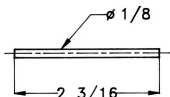
⑨ Main Bearings
2 off - Brass



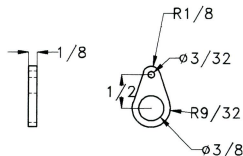
⑩ Flywheel



⑪ Column
2 off - Alloy



⑫ Crankshaft



⑬ Eccentric Strap
1 off - Alloy

length of black steel $\frac{3}{8}$ " dia. with a $\frac{1}{8}$ " hole through the centre, to go over shaft while pressing. This is not needed for a short crank pin. The piston has, but doesn't need, about six labyrinth grooves about 0.006" deep. If using a reamer, turn the piston 0.001" over-size and finish with 600 grade wet and dry paper until it just enters the bore. For the valve, drill most of its length $\frac{1}{8}$ ", leaving only about $\frac{1}{8}$ " left at $\frac{3}{32}$ " for $\frac{1}{8}$ " BSW tap. Turn the steam and exhaust grooves; they are not critical but the middle land needs to be close to $\frac{7}{64}$ " wide. The top end land is not critical but make the valve land and steam seal land as good as you can get. I turn and fit both the piston and valve "on the stick" and only cut off when fitted to the bores. I find cross drilling the piston for the wrist pin causes the metal to draw out of shape, so I do this before turning the piston. The main bearings are made over-length, then threaded onto the shaft and both finished to length. I mill to length, but a four-jaw chuck or file will do as well. The bed plate is just an oblong of $\frac{3}{8}$ " aluminium 2" x $1\frac{1}{2}$ " but any thickness down to $\frac{1}{8}$ " would do. There are two $\frac{1}{8}$ " holes for columns and two for the main bearings.

The fore and aft position of the front main bearing is important, and it might pay to leave this till last, when the cylinder block is mounted you can see where the con rod wants to line up. I press fit the cylinder head with 0.001" interference, if you're doubtful, don't force it, just solder it in. On the cylinder block, the first job is to face both ends to length, then drill and ream both bores. Drill the $\frac{1}{16}$ " port right through from the cylinder side, open it out to $\frac{3}{32}$ " at the plug hole, solder or screw in the plug. If it is intended to solder on the lugs later, hold the block in the four-jaw chuck and remove metal from each side till block width is $\frac{3}{4}$ " or so. A better looking job is very easy in the mill, and you can leave the lugs on, finally drill and tap the lugs $\frac{1}{8}$ " BSW. It really isn't difficult in this small size to leave the lugs on, even if working in the vice by hand. Be sure your file is sharp and you will need a good, new hacksaw blade very tight in the frame.

With all work on the block, go easy on vice and chuck pressure: you need enough to stop it slipping but not enough to distort the bores. The eccentric is from $\frac{7}{16}$ " or $\frac{3}{8}$ " round brass or steel. Face both ends, then drill $\frac{1}{8}$ "

for shaft as near one edge as you dare. Next, drill and tap $\frac{1}{8}$ " BSW through the thickest part (at max. throw). You can remove some metal at the sides of the eccentric near the grub screw if you like. The valve rod is turned down to $\frac{1}{8}$ " dia. for $\frac{1}{8}$ " and threaded $\frac{1}{8}$ " BSW $\frac{3}{4}$ " long. Reduce the threaded portion to 0.119" before using the die to avoid distortion. After cutting off the stick, cross-drill and tap one side of the fork. Then file or mill the fork to shape. The con rod and eccentric rod are plain drilling and filing jobs — the centres are not critical. Make the head to length after the engine is assembled. Relieve the head or piston if needed, to clear valve port. Leave $\frac{1}{16}$ " dead space above the piston. Remember, if you buy or borrow a reamer, make certain you only turn it clockwise, never anti-clockwise as you do with taps — you'll ruin the job, and the reamer!

Makes it all sound so easy doesn't he! However, there's a mile of experience behind all these tips, and we are very grateful to Bill for taking the time and trouble to pass on the fruits of his experience for our readers... ed.



A message to all Model Engineering Club members in Australia From The Australian Miniature Boiler Safety Committee and Australian Association of Live Steamers

By Dave Merrifield (Hon Sec-AMBSC) and Barry Glover (President-AALS)

We would like to bring your attention to some of the concerns that we feel are pervading the hobby in Australia at the moment.

With respect to boilers, there seems to be a general misconception, at least amongst the newer members of our fraternity, that AMBSC is an "authoritative body, over-riding all Club decisions, etc". This is *not so*. The Australian Miniature Boiler Safety Committee is a body of approved Boiler Inspectors, set up in 1966 to oversee the operations and affairs of miniature boilers in Australia.

Decisions are taken by this body at their Annual General Meeting held each year at Easter, in a nominated State. A Charter was agreed by all Societies then registered in 1986, and amended in 1990. This is binding on all Societies who are a party to that Charter, and is a condition of entry to those who have joined since its acceptance.

It should also be understood that the decisions taken by the Boiler Inspectors present at those meetings are binding on all Societies registered with the AMBSC, and that the Executive committee appointed to administer these decisions have *no vote*. We only carry out the wishes of the members concerned.

We are extremely concerned at the attitude displayed by a large number of Clubs over the recent Levy. This was foreshadowed at the Perth Convention in 1993, democratically

moved, debated and voted on at the Wollongong Convention in 1994, and the consequences of non-payment decided at the Townsville Convention this year. It would seem that a very few Clubs have seen fit to accept the majority decision graciously, but would rather blame the Executive.

The situation is reaching the point of *no return*. We have to accept that AMBSC has been handed the responsibility previously carried by the various Government Departments, and recognize that this will be the fact that we will have to cover ourselves for Professional Indemnity, which will mean a lot of money! We may also require a full time office with staff.

We should not forget the role of the Australian Association of Live Steamers. They, like AMBSC, are constituted on the same lines — their Officers *cannot dictate* policy, rules, etc. The decisions are taken by the member Societies, as the AALS Executive has no vote.

As with AMBSC matters, changes are also happening in our work place, both in our full time occupation and our hobby. This is especially so where Club life deals with members of the public.

The recently introduced AALS Codes of Practice will hopefully ease the path into these changes, and with each Club preparing its

training manuals, and then putting its training programmes in places, each member will be more aware of their individual responsibilities.

It would appear that there are an increasing number of "small" Societies being formed, which will eventually erode the financial base, if this trend continues. Those current small Societies that are proposing that the Levy be based on boilers registered, or even members on the books, would soon run the AMBSC into bankruptcy! This would come about since there would not be enough income to cover future expenses, and should individual rates be set to account for this, we would be back to square one! (the big Clubs are currently subsidizing the small Clubs).

The costs of any organization are continuing to rise, and bodies with a technical content such as ours will also continue to find their costs increasing. Increased responsibility of both groups requires that we have to maintain, and indeed, increase, our liaison with Government bodies. Insurance is also becoming a major, and at this stage, unknown, cost factor.

If our hobby is to continue operating in the way that we currently enjoy, it must be funded by you, the Club members. We trust that you can all understand these sentiments, and put your weight behind us to enable us to reach the goals which you desire.





Photos by Peter Lawson

How do you communicate the enthusiasm of our hobby to the general public? Hold an exhibition — a railway exhibition. So Railex was born, the brainchild of Dr David Cooke, a committee member of the Evandale light railway and Steam Society.

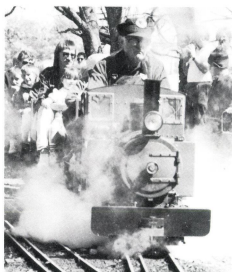
The first Railex was held in November 1993 and was a success beyond everyone's imagination — the image still lingers of queues of patrons waiting long into the afternoon for their ride on the steam trains working the 7¼" gauge ground level railway. The lure of trains was such that Sir Phillip Bennett — the Governor of Tasmania — made an impromptu visit that year. In 1994 he was back, as honoured guest to officially open the event!

The layout

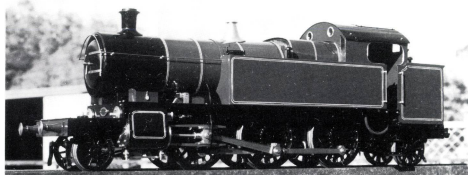
Railex is mostly accommodated at the Evandale Falls Creek Reserve, near the Launceston airport some 20 kilometres from the city.



Geoff Stevens with his 5" gauge 0-6-0 locomotive *Achilles*.



Chas Goodwin and Dundas ease out a train at Railex '94.



Ian Simpson's beautiful 3½" gauge Great Western Railway 2-6-2 Prairie Tank No 99.

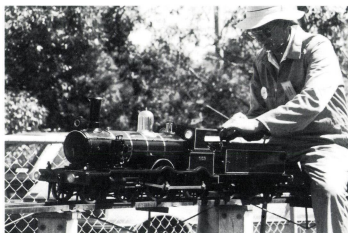
It features 400 metres of dual 5" and 7¼" gauge ground level track, with an additional 200 metres of elevated 3½" and 5" inside

the main formation. There are about 100 metres of sidings. Thanks to an astute purchase from Tasrail, there is a genuine railway office which has been converted to a station. The difficult task of off-loading locos from trailers has been made a lot easier by a system of traversers giving access to the steaming bays.

The exhibits

First thing to catch the eye are the small scale electric model railway layouts, ten of them, spread thought the large hall. They are augmented by static displays of steam machinery, trade stands and a period atmosphere provided by black and white films showing steam locomotive construction. One of the more unusual and popular exhibits was a complete model of a working quarry by Noel Blenkhorn. This was operated by remote control with all the operations being controlled by compressed air! The sound of the compressed air control added to the realism of the display. Little and not so little kids just stood and watched the exhibit for ages.

Next door was Geoff Baumgartner's nearly completed Victorian Railways B class diesel. Evandale president Peter Lawson displayed his partially built 7¼" gauge Heidi. It remains partially built because Peter keeps getting side-tracked to the construction and upkeep of the railway, but this Winter... here's hoping.



Miles McGinnis' 5" g NSWGR Z class Beyer Peacock 4-4-0.



Peter Lawson with a V class TGR shunter and a happy consist.

Outside at the entrance to the station, Barry Yewen displayed his just completed Li'l Lima, this version features oil firing, but can be converted to coal firing if necessary. No railway would be complete without breakdowns, and so to show that Murphy is still around, the loco which usually does the lion's share of passenger hauling during the year decided to burn out a firebox coil.

Despite much burning of the midnight oil by Greg Waddle, the loco was unable to to take part in Railex '94.

Motive power

With Greg Waddle's *The General* being out of action, the major part of the steam powered workload was taken up by Charles Goodwin's *Dundas* and Max Hayes' pacific locomotives. Big diesel power was provided by Graeme Reardon's petrol-electric, based on a TGR Y class, and Max Hayes' large Commonwealth Railways diesel. Peter



Geof Marshall and his 5" g Rocket

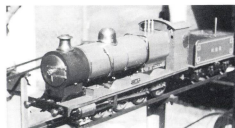
Lawson's V class and Peter Crowder's Mt. Lyall shunter filled in the gaps, scurrying around like little terriers among the larger locomotives.

Moving people

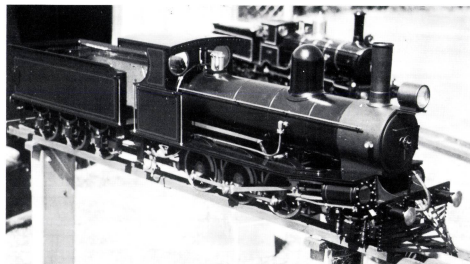
Over 3500 people are moved during Railex. Now this may sound like small beer to some of the larger interstate clubs, but, to we folks at ELRSS, it is about ten times the number we get at a good monthly running day! The Railex generates considerable income for the ELRSS, with these funds being channelled into track improvements and also being set aside for a club locomotive. In fact, a club locomotive is now looking a reality for 1996!



Graham Reardon driving the TGR Y class. This unit is fitted with a 5hp petrol motor and two 50A alternators. C40 generators are used as series wound motors.



Bill Smith's 5" g Robinson 0-8-0.



Alf O'Brien's 5" g 1 1/2" scale TGR C class 2-6-0

The society has applied funds to construct remote operated points with associated operating signals, all in the name of operational convenience and safety. At the same time, plans are afoot for a large storage shed (served by its own siding), track extensions and a tunnel.

To cope with the increasing numbers of public visiting, the concrete aprons at the station also have been extended, and better crossings built to give vehicular access to the elevated tracks.

Finally

There are some opinions in the club who maintain that to mount major exhibitions is not what the club should be doing, but the fact remains that without railex, the society would be strapped for funds, and the capital works program would still be on the drawing board, instead of in use. The event has also brought together the many steam and model train enthusiasts from throughout the state. It has even convinced and encouraged many from the Hobart area to cross that invisible (but very real) dividing line, to see what's happening in the north of the state.

Planning for Railex '95 is now well under way. See the advertisement elsewhere in this issue.



Club Roundup

Coming Events

2 and 3 September

Birthday run - Central Coast NSW

Central Coast Steam Model Co-op invites all clubs to their 14th Birthday steam-up. Track located at Lot 10 Showground Rd, Narara. Contact: Tom Winterbourne (043) 25 4838.

30 September to 2 October

Invitation run - Port Augusta SA

At the Port Augusta Model Engineers track, Homestead Park, Elsie St. Enquiries phone Ernie Riding (086) 42 3858

6,7,8 October

Annual Steam Fest - Galston NSW

The IHDMES invites all model engineers to their annual steam fest. Friday is club only, Saturday and Sunday open to the public. (Date in last issue was wrong)

21, 22 October

7th Australian Traction Engine Rally

The Inverell Pioneer Village, NSW, is the venue for this year's national miniature traction engine rally. Contact: Bob White (067) 22 1569 or Gordon Blake, (067) 22 4272.

21, 22, 23 October

Open weekend - New Plymouth NZ

An open invitation to an open weekend at the New Plymouth Society of Model Engineers.

21, 22 October

2 day run - MELSA Bribie Island

All clubs, 5" g and 7 1/4" g locos and public welcome. BBQ on Sat. night plus night run. Camping on site. Canteen open all weekend.

21, 22 October

AALS Vic Branch - meeting

Interclub run at Euroa Vic. plus regular public run on Sunday.

28, 29 October

New complex opening - DVR Vic.

The Diamond Valley Railway invites everyone to the official opening of their new complex. Also the 34th anniversary of public running. An interstate 7 1/4" g "Corrobee" is also planned.

4, 5 November

Invitation run - Wagga Wagga

Info contact: David Font, PO Box 119, Mt. Austin, NSW, 2650. (069) 21 4762

5 to 10 January 1996

Steam Expo 96 - New Zealand

Otago Model Engineering Society. Contact the Convener, PO Box 2163 Dunedin 9030 New Zealand.

Castledare WA

The initial donation of coal from Western Power at Kwinana Power Station was unfortunately deemed unsuitable for Model Locomotive use, due to it containing more than half its volume of dust and fines, being more suitable for mechanical firing of industrial furnaces. Although screening recovered a percentage suitable for use, it now appears as if the club will revert to its previous supplier at Collie.

On 14 March 1995, an "Expo on senior activities" was held near the club station, conducted by Canning City Council.

Twelve local members journeyed to the vast Territory east of the Black Stump, to attend the 1995 AALS Convention at Townsville. By all accounts, all had an enjoyable four day stay at a very well organized convention, and all expressed surprise and satisfaction at the extensive 2.4km trackwork and facilities of the host club - The Townsville and District Society of Model Engineers.

Keen club members Jeanette Richter and Paul Sherman, chose the Castledare Railway as their wedding venue on 18 March. Steve Reeves has his steam locomotive *Sarah* polished and decorated to perfection for the occasion, and duly collected Jeanette from her white air conditioned Rolls Royce conveyance at Wilson Park Station.

Castledare Miniature Railways Inc.

Location: 100 Fern Rd, Wilson, Perth WA

Public running day: 1st Sunday of each month.

Millswood SA

The clubs' annual "Show of Work" night, held late last year, was judged to be a great success, and was well supported by members with a large range of finished and semi completed models, including locomotives, stationary engines and workshop equipment. On 6 November 1994 a ceremony of remembrance was held at the club, in memory of the late Brian Niesche. The event marked the dedication of a memorial tree and a small plaque was unveiled, reminding members of this dedicated model engineer. Recent visitors to the club were Mr Mark Brindal, MP for Unley, English visitors Gordon and Val Roe, Paul Brown from Nelson NZ, and a chap from Newport club, Wales, UK.

The society is looking forward to its 50th Birthday in 1996.

The South Australian Society of Model and Experimental Engineers Inc.

Location: Millswood Crescent, Millswood SA

Public running day: 1st Sunday and 3rd Saturday of each month.

Warner QLD

The new 5" gauge *Northumbrian* Locomotive built by Jim Jackson and owned by Chris Wilson, entered service in February, showing its paces around the elevated track.

At the February AGM, the Chris George Trophy, (the club member of the year award) was presented to Lester Nunn. Reg Heppell was appointed a life member. The past twelve months saw the completion of the elevated track, work on the air operated points motors, overhead bridge and ground level station work, with landscaping an ongoing project. A new points control panel has been installed in the Jubilee signal box. Work also continues on the provision of a new main line. Eric Evans continues his valuable technical discussions at monthly meetings. It is reputed that Dave Harper's knees "Go to Water" when he discovers old tomes (Books) on steam, and his latest find apparently had the same effect.

A measure of this club's success is found in the level of co-operation amongst members.

Queensland Society of Model and Experimental Engineers Inc.

Location: Lot 5 Warner Rd, Warner, Brisbane, QLD

Public running day: NIL

Wellington NZ

On 5 April, thirteen members of the **Hutt Valley Model Engineering Society**, spent a very interesting evening at the Petone printing plant, which produces local newspapers.

Paraparaumu members have now completed removing their original trackwork and station. The bridge has been fitted with additional sleepers, and new track prefabricated and new alignment pegged out. On 21 April, the former station concrete base was removed, and a large concrete pour was undertaken to fill previously placed boxing. Much work now remains to be done to finish the complex prior to its re-opening for running.

Maidstone members have recently hosted members from New Plymouth, Palmerston North and Wanganui, and some reciprocal visits have taken place. These visits benefit all clubs and members.

Hutt Valley Model Engineering Society Inc.

Location: Marine Parade, Petone, NZ

Paraparaumu Associated Modellers Inc.

Location: Marine Gardens, Raumati Beach

Maidstone Model Engineering Society Inc.

Location: Maidstone Park, Upper Hutt

Toowoomba Qld

New office bearers have been elected at the 1995 AGM with Bob Long holding the position of President, and Daniel Pederson that of Secretary.

The club is presently negotiating with the Toowoomba City Council for a new site for track relocation, following heavy rains in February, which resulted in track foundations being undermined at the Willow Spring Adventure Park Site. The track has been lifted for refurbishment and storage prior to re-installation, when a new site is established. Members will then be busy rebuilding on the new site, and overhauling the club loco *Romulus*.

David and Beverley Fraser recently travelled to a large property at Blackwater, whose owner has built a Brazilian 4-10-2 locomotive and six passenger cars, which operate on 13½ miles of track. The locomotive was fired up and the guests reported a perfectly smooth ride on the very long track.

The trip also included a visit to a North Rockhampton 245 acre property, which boasts 8¼ miles of 7¼" gauge track, operated with three locomotives and eight passenger cars.

Toowoomba Live Steamers Inc.

Location: Awaiting re-location

Public running day: To be advised

MELSA — Bribie Island Qld

The QR passenger brakevan which the club acquired some 18 months ago has now been converted into the club's canteen complete with power, lighting and running water. It is hoped to extend a verandah out the back where visitors and members will be able to sit and watch the trains go by. The other half of the van is to be turned into a club library/video room in the near future.

Grass has now grown over the new extension of the track, so sand is no longer a problem while most of the dips and sways on the new section have been eliminated. Future improvements include another passing loop in the station area and a second approach on and off the turntable.

Finally we would like to congratulate the Townsville club for hosting a magnificent convention last Easter — to any of you who didn't go you don't know what you missed.

MELSA, Bribie Island Inc.

Location: Toorbul St. Bongaree, Bribie Island Qld.

Public running day: 3rd Sunday of each month

Geelong Vic

Our club recently attended the Heritage and Vintage Meeting at the Geelong Show Grounds.

Club Members put on a large display which was set up in the Machinery Shed. The display included Loco's in various stages of construction by club members. Completed models included 3½" *Britannia*; 3½" *Titch*; 5" *Simplex*; 3½" *Britannia* castings and

frames; 5" *Simplex* frame and wheels; 2½" *Flying Scotsman* frame, wheels and tender; 3½" *Rob Roy* and a short piece of multi gauge track. Other items on display included partly constructed rear wheels to suit a 3" scale *Cliff and Bunting* and several very nicely completed stationary steam engines. There was quite a lot of interest shown in the models by the Public.

The Club meets in the Austin Gray Centre (Geelong College Grounds) Aphrasia Street Newtown 7.30pm every 3rd Wednesday of the month. The club has work shop facilities available. Models completed and under construction include machine tools, traction engine, small steam stationary engines, steam boats, clocks and loco's of various sizes.

Club members have presently a total of 16 completed and partly completed locos in 2½", 3½" and 5" gauge.

Membership is open to anyone who is interested or just wants to be involved with the Hobby. Visitors are most welcome.

Geelong Society of Model and Experimental Engineers Inc.

Contact: PO Box 442, Geelong VIC 3220

Edgeworth NSW

Club Members of the Year: Congratulations to Trish Burns for winning the club member of the year award presented by the ladies for her work within the ladies auxiliary over the years. The other club member of the year award was presented to Phillip Little for contribution to the club, congratulations to both these members for winning this award.

A special area has been created outside the disabled toilets, this area, which includes a concrete pad, has been created so as to allow cars carrying wheelchairs to drive up outside the toilet block and allow easier access to the disabled toilet.

New Locos: On Sunday 5 February 1995, two new locos made their debut, they were Dallas King's 5" gauge 0-4-0T Blowfly loco named *Maget* and Bill Fowler with a 5" gauge freelance design loco named *Mongrel*.

Life Membership: Congratulations are extended to Dave Evans who was rewarded for his work over countless years for the society. This was presented at our birthday run on Saturday 25 February 1995. Well done Dave.

7¼" gauge track extension: On the Saturday of our birthday run on the 25 February 1995 the 7¼" gauge track extension was officially opened by Tom Burns. Howard Cilliv driving *Silverton* and Frank Ford driving *Iron Lady* drove through the ribbon stretched across the track at the little harbour bridge.

Lake Macquarie Live Steam Locomotive Co-Op Society Ltd

Location: off Velinda St, Edgeworth NSW

Public running day: Last Sunday of each month except December

Eltham Vic

Diamond Valley Railway is planning another 7¼" gauge Corroboree for the weekend 28, 29 October 1995. The main purposes for this Corroboree is to officially open the new Nillumbik workshop/clubrooms complex and to celebrate 34 years of passenger operations.

Hopefully, we will have many visitors from kindred societies and 7¼" gauge locomotives (and rolling stock) to participate in our activities.

Plans so far include a fun run day on the Saturday with night running until midnight, with a BBQ during the afternoon and possibly films and videos in the clubrooms. On Sunday we will encourage our visitors to help out in public operations. In recognition of the support of the public over the previous 34 years, we plan to charge half fare per ride on this day.

The following members are handling the organization of the event: Robin Quaife (03)93064150; Brian Coleman (03)97625186; Ian Petersen (03)97496461; Ron May (03)9560 5656

There will be no registration fees, so just come along and enjoy yourselves. If you do intend participating in any or all of the activities would you please write to the above address or telephone one of the organizers.

Arrangements can be made to handle arrivals and departures at any time between Wednesday 25 October and Wednesday 1 November inclusive. Please let us know.

Diamond Valley Railway Inc.

Location: Lower Eltham Park, Main Rd. Eltham, Vic.

Public running day: Every Sunday except Christmas day.

Invercargill NZ

Welcome aboard! AME recently received the first newsletter from the Southland Society of Model Engineers.

It contains a humorous account of a member's cluttered workshop, and his wife's response to hubby's attempt to start yet another project!

A suggestion to refurbish the portable track is interesting. Members could build a section to run on at home, then combine the sections for a large track when the occasion arises.

The club library has new carpet, this could provide a warmer venue for winter meetings.

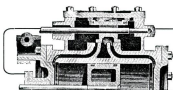
The society also caters for HO/OO and N gauge model railway modellers. There is also a marine interest, the society has its own pond at Surrey Park.

Some important dates coming up in the South:

30 September; the Flyer Festival at Kingston. 7 October; Club efficiency trials.

Southland Society of Model Engineers.

Location: Surrey Park, Invercargill NZ



Steam Chest

with Dave Harper

I'm regularly gratified with the responses to this column, but I've never had such a quick response as I got to the May-June issue. I'd barely opened my own copy of AME when the phone rang; it was Ken Saunders ringing to tell me that he knows the bloke that built and owns the steam paddle boat! His name is John Le Noble and he lives here in Brisbane.

Ken was able to tell me that the paddler runs on Lake Cootharaba up on the Sunshine Coast, but it's decidedly top-heavy and only suitable for such shallow and calm waters. Apparently the lake is so shallow that the paddles hit the bottom before the boat capsizes!

Due to pressure of organizing the QSVMS Rally, among other things, I haven't caught up with Mr Le Noble yet — but I will.

A day or two later I received a packet of stuff in the mail from Terry Paton of the Steamworks. Terry had some comments to make about the Shanks engine at Caboolture Historical Village, also in issue number 60, which I called, in my innocence, a bottle engine.

Apparently bottle engines are a pet subject of Terry's, and the Shanks engine is definitely not one! As it is mounted on a base complete with boiler, it is a semi-portable engine, but Terry admits the design of the Shanks doesn't fit any regular description, being unique in his experience. He goes on to say:

"The Shanks engine design has few peers but it nevertheless remains in prevailing ter-

minology 'a self-contained inverted vertical engine.'"

The more common workplace engines of this sort had the crankshaft aligned through the major openings of the mainframe so that all motion parts were at ninety degrees to the mainframe. Why Shanks chose to reverse that accepted design is a mystery and if you lay the Shanks engine horizontally you have the standard layout of a horizontal steam engine!

But the Shanks engine is *not* a bottle engine!

The origin of the term "bottle" to describe a steam engine is obviously a colloquialism, but one which stuck. It refers to a design that emerged from the base in an outward curve and then continued upwards in a reverse curve to form the rim to support the cylinder, in the same way that late 19th century bottles had round bottoms.

The design appears to have originated in the USA where scores of manufacturers made engines of this design. Strangely, there are very few UK examples of bottle engine.

The design was clearly a very utilitarian one possessed of great mainframe strength and simplicity of construction.

Most USA manufacturers of this type, cast all mainframe components to accept on-site pouring of main motion bearings in white-metal. That obviated the need for expensive motion alignment machining and separate bearing casting and machining.

The bottle engine was produced in thousands for small workshops and, in reversing form, powered countless small boats in the USA. Some huge examples were built, even in Australia there were some semi-portables with boilers of huge proportions.

Terry also sent me copies of some American price lists, with one of them, E. H. Wachs of Chicago, Ill., listing engines from a 3" x 3" 1.5hp job with a bottle diameter of 14" up to a 13" x 12" monster of 45hp, 50" diameter and weighing 6200lbs for export!

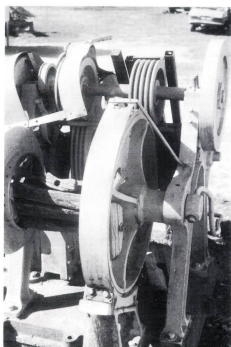
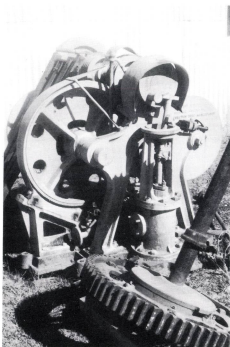
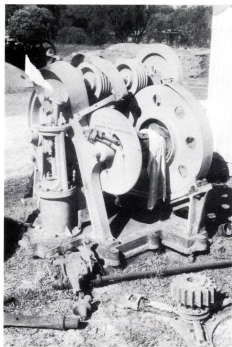
Unfortunately the illustrations in the price list are not be suitable for reproduction, but there is a large bottle engine in Graham Chapman's yard just up the road from me, which I will be definitely trying to photograph for next issue!

Terry correctly says that a bottle engine would be a great modelling project, and would be interested to hear from anyone with similar ideas. Answers to me via the editor, please.

Friction drives

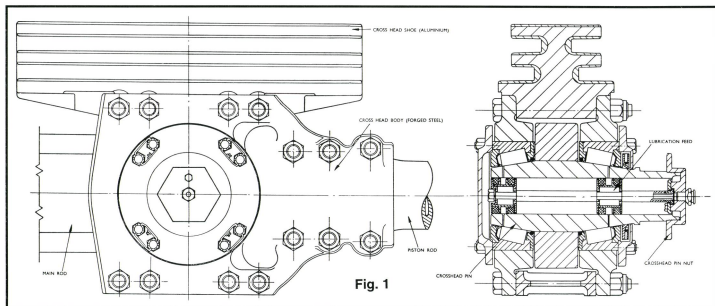
The friction drive on the Caboolture sawmill also caught Terry's eye, and he kindly sent me some photos of an interesting steam winch.

Terry has this to say about friction drives: "The friction drive is a mechanism that was common for winches that needed quick response. The friction wheels were essentially a clutch and only a small amount of movement



Three views of the friction drive winch on the Caboolture sawmill.

Photos: Terry Paton



was required to engage and disengage them. This was effected by turning the ends of each drum shaft eccentrically where they were supported by the mainframe. An extension of the shaft was fitted with a collar and a lever.

When the lever was depressed the main drum shaft changed the position of its axis and brought the driving and driven wheels together. Once engaged the required frictional force was applied by the operator's foot on the lever.

This type of winch was for essentially light duties and for haulage where there was no return load on the winch.

Graham Chapman has a very interesting example driven by a true vertical engine (cylinder at the bottom, crankshaft at top). This winch came from the old whaling station on Moreton Island. It's a two-drum winch driven by a non-reversing engine. It was almost certainly used for removing large sections of blubber during flensing operations where quick response was needed on two areas of the carcass.

Returning the wires was done by hand with

the winch drums free-wheeling. The winch is fitted with a quick action steam valve or regulator to control the speed once the friction drive was engaged and under load. A very interesting machine and a great model engineering project that would actually DO something!"

Right on there, Terry. Could be built to a reasonably large scale, say 1/8th, to produce a model of decent size. Any takers?

As you may have gathered, Terry's interests and mine are very similar. We have long chats on the phone!

Sirius/Alco generating set

At the recent Antique Machinery Fair in Brisbane, I was delighted to spot an original example of the Alco steam generating set. These little units were produced for use behind enemy lines during World War II where they could silently recharge batteries for resistance radios.

The engine was built by Stuart Turner and is known as the *Sirius*. It has been described in Model Engineer, and numerous models have been made.

However, I had never seen one of the original sets, complete with generator, and thought readers may also be interested in seeing it.

Consequently, I had a good yarn with the owner, David Brownsey, whose main interest is in old radios etc. He kindly sent me the photo. David has been trying to collect information on the original sets, as they were apparently also used in Papua New Guinea during the

war by the coast-watchers and others.

He has obtained copies of several articles from the Stichting Airborne Museum in the Netherlands. Unfortunately, they're in Dutch! Is there anyone out there prepared to translate them into English for us? We would all be much obliged if someone could help us... replies via the editor, as usual, please.

Crossheads part four

Last issue I promised to talk about trunk crossheads but meantime yet another reader has kindly passed on some great information which I'll use now rather than later.

Gil Tetley from Jimboomba, south of Brisbane, contacted me and to say he had some good stuff on loco crossheads from A. W. Bruce's book *The Steam Locomotive in America*, and also an old Railway Manual produced by British Timken Bearings which he acquired many years ago.

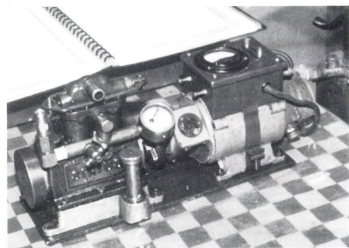
Timken's apparently did a great deal of work before WWII on lightening the con rods etc of the last generation of steam locos. This was to reduce the out of balance moments generated by these huge engines at high speeds, one of their main problems, causing pounding of the track and particularly bridges.

I recall reading somewhere that the primary reason for British Railways replacing their steam fleet with such inexcusable waste was because it was cheaper than replacing all the underbridges which were being pounded to destruction by steam locos!

So, Gil kindly sent me the beautiful drawing reproduced here of their lightweight, roller-bearing crosshead. The accompanying text reads as follows:

The design of the crosshead is shown in Fig 1, from which it will be seen that the crosshead pin forms part of the Timken bearing. The pin is a press fit in the front end of the main rod, and the bearing cup and roller assemblies which are self contained units are fitted into the crossheads.

This bearing assembly is used in conjunction with a Timken design of crosshead body



Alco steam generating set, the unit is powered by a Stuart Turner built *Sirius* engine.

Photo: David Brownsey

which is split vertically, and secured to the piston rod by keys.

Pounding in the front end of the main rod is avoided by this design of assembly and the Timken crosshead permits quick removal of the piston rod.

The crosshead pin holds three pints of lubricant, and this can be replenished by a pressure gun through a fitting in the crosshead nut. By incorporating some of the features... it

has been found possible to reduce the weight of the reciprocating parts of the motion in a number of locomotive designs. This in turn has enabled a reduction in the dynamic augment to be made, and this has resulted in improved riding of the locomotive.

American practice

A. W. Bruce has this to say on the subject:

"No basic change has been made in the power transmission linkage between the cylin-

der and the driving wheels since 1831, because no simpler means has been developed."

Crossheads

One of the most essential parts in the power transmission linkage is the crosshead which connects the piston rod to the front end of the main rod and which transmits the vertical component of the piston thrust to the guides. Fortunately, this component in forward motion is always upward so that the lower guides need not always be made so rugged as the upper guides which take the most punishment on road engines.

The guides and crossheads in the very early engines took various forms. Among them were the single bar guide, in which the crosshead completely housed the single guide, and a two-bar guide arrangement consisting of two round guides, one above and one below the piston rod. Neither of these arrangements was suitable for the larger engines that soon appeared and required a better design.

Figure 2 shows the basic types of crossheads that have been generally used since locomotive design attained reasonable stability. The functions of the crosshead cannot be disguised, and it must be made as simple and light as possible together with a low unit bearing pressure on its wearing surfaces.

Sketch D shows a light integral single-shoe crosshead in which the guide, rather than the crosshead, houses the bearing surfaces. This design is generally known as the Dean crosshead and has a much larger bearing area in forward motion than the previous four-bar construction.

Sketch E shows the final multiple bearing crosshead as developed in about 1915 on the Pennsylvania Railroad. It is very similar in design to sketch D, except for the addition of two bearing "wings" on each side which fit into corresponding bearing grooves in the guide and thus provide the much needed additional bearing surface. Contrary to many expectations, this crosshead, when properly machined and fitted to the guide has given remarkably good service. It naturally requires good lubrication, but it has virtually replaced all other types on all large engines built since about 1935 because it is relatively light in weight and high in bearing area.

The four-bar type of guides and crossheads was superseded in about 1880 by the Laird type on the larger engines. This crosshead enclosed the smaller lower guide with its top face bearing against a heavier upper bar. Very soon, in about 1890, the Alligator crosshead was developed as a symmetrical design with interchangeable top and bottom shoes.

Both these crossheads were very popular and remained in service on virtually all types of locomotives until they were eventually superseded on the larger engines by the multiple-bearing crosshead in about 1935.

Well, I think that more than covers it for this time, trunk guides next time for sure!

Until then, happy steaming.

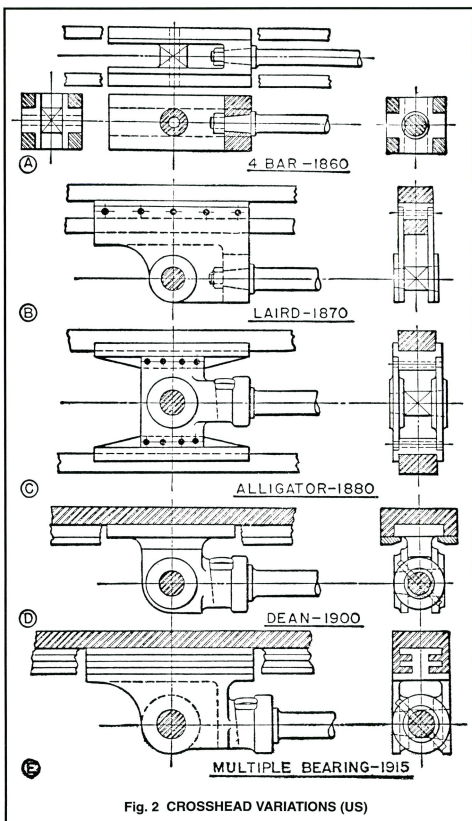


Fig. 2 CROSSHEAD VARIATIONS (US)

Nilgiri's Cliff-hanging Rack Railway

by Geoff Murdoch and Doug Coull

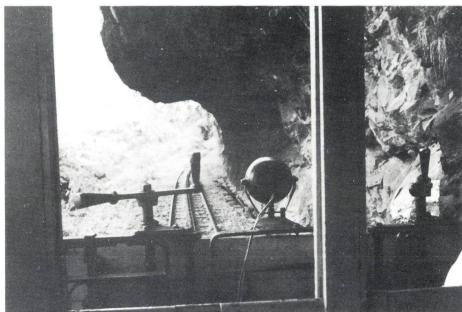
Photos by Geoff Murdoch

Geoff and Doug sent in this exciting adventure on an unusual railway. The original story has been enlarged — with the authors' permission — to incorporate details of the Nilgiri X class locomotive. The X class would be an ideal project for those who like to model unusual prototypes... bmc

If you're seeking something entirely different, the Nilgiri Hills of Tamil Nadu, South India, are the region to visit. A unique railway meanders through part of these hills, up to the holiday resorts once used by the British and still enjoyed today by travellers escaping the heat of the plains.

The railway reaches from the plains to the top station at 2134m (7000 feet) — 610m (2000 feet) below the surrounding peaks — using racks for part of the way. It's superbly scenic. And we were treated to even more exotic sights through an unscheduled breakdown that was a model engineer's delight!

On a business trip to the southern city of Coimbatore, we learnt while reading a *Lonely Planet Guide* that the metre-gauge rack railway from Mettupalayam to Udhagamandalam was only 40 minutes from our hotel. Udhagamandalam was renamed from Ootacamund, hence the still-current abbreviated name of



Or is it the hanging-cliffs... a spectacular scene on the Nilgiri railway.

"Ooty". Not wishing to miss out on this opportunity, we immediately extended our stay to travel on the famous Nilgiri passenger train.

On the day of the Nilgiri trip and with business in Coimbatore behind us, our two guides picked us up at 6.30am sharp from our hotel and drove us to the bottom station at Mettupalayam. Without their assistance and sense of humour, our stay would not have been as enjoyable as it was.

At the depot, coal was being loaded into the locomotive bunker by girls balancing woven coal baskets on their heads while the crew were oiling and checking the loco. Rakes of carriages and a repair shop were nearby. The station was filled with people waiting for the arrival of the broad-gauge (5 feet 6 inches) tourist train from Madras.

The locos

The railway's 12 rack locomotive are X class 0-8-2RTs built by the Swiss Locomotive and Machinery Company at their Winterthur Works from 1914 to 1951-52. They are constructed in such a way that there is a large gap between the second and third drivers so that

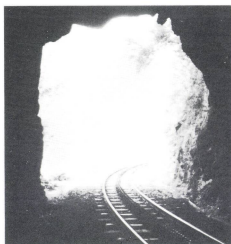
the rack unit, which is driven by a separate set of cylinders, can be slung low to allow the pinion drive to engage the rack section.

The racks

The rack is positioned in centre of, and about two inches higher than, the rails. The actual rack



Some sections of track give-way to the mountain!



Out of the tunnel gouged from rock and on to a ledge built out from the hillside.

Nilgiri X class 0-8-2RT

Running Nos.	Construction Nos.	Date	Early Nos.
37384	2456	1914	X1
37385-88	2734-36/33	1920	X7-X10
37389-90	3000-3001	1925	X11-X12
37391-95	4069-73	1952	X13-X17

consists of two sections side by side. Each section is about 32mm wide spaced about 19mm apart, staggered longitudinally so that one tooth of the pinion is always in contact with the rack.

Surprisingly, this rack section is very dry and quite worn in parts, while other parts are okay. We expected it to be heavily greased. For the entire length of the rack, each section

nance and replacement program is carried out. At frequent points along the track the dates of the last maintenance are painted on black squares on the rock faces. Later in the day we noticed a track gang were building pre-fabricated sections of track using a combination-type gauge to set the rails at the correct distance apart and the rack section at the correct height.

A good view

Before we boarded the train at Mettupalayam we showed the crew some photos of 5 inch and 7 1/4 inch gauge model trains being driven at the Willans Hill railway at Wagga Wagga in New South Wales. They were amused to see such small "toys". The Nilgiri passenger train is made up of either four or five carriages which are pushed in front of the locomotive to prevent runaways. Each carriage has a guard ready to operate either or both of the hand brakes — one for normal track and the other for the rack sections.

Our guides had once again excelled as they had arranged for us to sit in the first-class



*At one of the hill-side stations. These locos are quite long for metre gauge.
The main train guard is second from the left.*

compartments in the front of the train. The only person with a better view was the main train guard on the outside platform of the leading carriage.

Within a few minutes everybody was seated, the whistle blew and the journey began.

The south of India is at present going through a similar dry period to that of Australia, but under the influence of the Nilgiris this

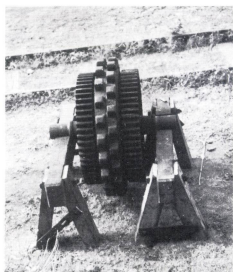
section quickly becomes lush and green. The plains section crosses a strong girder bridge over the Bhavani River, then slowly increases in gradient as it passes bullock carts, cattle and people waiting at the many dirt road crossings. The front guard continually sounded an airhorn as a warning. This section goes for about five miles and reaches a maximum gradient of 1 in 38. We continued until we reached Kallar, the first stop for water, where the first rack section is engaged.

The rack is engaged

Having never seen a rack railway before, the sight of a railway track changing from 1 in 38 to 1 in 12.5 — in no more than the length of the train — was incredible. At each change of gradient over the entire length of the line are gradient posts showing "before and after"



The contrast between level track at a hill station and the rack section can be clearly seen in this photograph



The spare locomotive pinion drive. One of these is stored at each hill station.



Working hard on the rack section while crossing one of the many bridges.



The general scene of the metre gauge storage facilities at Mettupalayam. The track on the left of the carriage shed (left photo) is the first five mile adhesion section to the mountains beyond.



gradients. The rack section from Kallar to Coonoor rises 1311m (4300 feet) in 19km (12 miles).

After watering, the train moved slowly, forward over the rack section while one of the crew checked for proper engagement of the locomotive pinion. When satisfied, he jumped back on to the train. These checks are mandatory at the beginning of each rack section, and are sign-posted as such.

The noises from the loco were now much louder and faster than before, due to the steepness of the track and the reduction gearing of the rack-and-pinion drive unit. The locos have a cut-off valve to allow the adhesion cylinders to be coasted while the pinion unit is in operation, or vice versa.

As we climbed higher, the vegetation became thicker and greener. Having our ears "pop" due to the increase in altitude on a railway was quite a novelty! The front train guard highlighted various items of interest, including monkeys and elephant droppings: the previous day a herd of elephants had blocked the line.

Cliff-hanging

Onwards we climbed, winding all the time through extremely narrow cuttings or hugging the steep sides of the mountains (sometimes on rock ledges) and beneath overhanging cliffs into Hillgrove for another watering stop. Here, passengers alight to enjoy hot sweet coffee, bananas and the spectacular views of the Nilgiri Hills.

Each hill station has a very short and relatively flat section of normal adhesion-type

track where, if required, the loco can carry out some switching on to short sections of track. These sections, we were told, date back to the days when the tea trade used the railway. Here also is the storage place for spare rack sections, rail, sleepers (which seemed to be alternately spaced, steel and wood, for the entire length of the track) and a spare pinion drive wheel resting on a wooden storage frame in the open for all to see.

The re-start from Hillgrove station adhesion track to the rack section was spectacular: straight into a curved tunnel. For railway enthusiasts wanting to hear steam locomotives working hard, this trip is a must! We came out of the tunnel into another steep-sided cutting, over small bridges with no check-rails, always on a curve. When we looked down there was no sign of support as the carriages overhung the narrow bridges, the winding roadway being hundreds of metres below.

A shuddering halt

As we travelled beneath a small overhead footbridge into another curved cutting, the train quickly came to a halt and started to roll back. The whistle on the loco was furiously blowing and the guard on our carriage (and no doubt all the others) started to wind frantically on both hand brakes. We came to a shuddering halt. After a few minutes the guard and most of the passengers went back to the loco to see what had happened.

One of the bolts holding the main pinion drive together on the loco had sheared, and we could go no further!

Undaunted, the crew chocked the loco with rocks under each wheel, wound on the hand brake of the pinion drive unit, and set about repairing it. Here was an ideal time for us to inspect it!

You have to see these narrow-gauge, inside-frame locos, with the rack-and-pinion drive unit slung between the gap in the drivers, to appreciate the difficulty of crawling inside the frames amidst all that gear-

ing to carry out repairs. Within twenty minutes, however, the pinion bearings were split and removed to allow the pinion to be shifted so the broken bolt could be removed.

Boy, were those mechanics dirty!

Word was telegraphed to Coonoor about five miles uphill for a relief loco, maintenance crew and spare parts to come down to meet us. Much later, the relief loco arrived with crew sitting all over it. The crew set about repairing the crippled engine; the whole exercise took about three hours.

Walking in paradise

During these three hours, a great opportunity was realized: we had time to walk in the famous Nilgiri Hills. First we ventured tentatively over a short curved bridge crossing a trickling stream, then further along the rails, up a walking-track in the side of the hill for a short distance. We compared trees and flowers with those we were used to, watched buses negotiating hairpin curves on the roadway hundreds of feet below, and laughed with the Indian boys as they called out to girls walking along the road in their colourful saris.

This opportunity gave us time to acclimatise, avoiding altitude sickness, and for Doug



The relief loco arriving through a gouged out rock tunnel! — not far from the disabled train.

Nilgiri Railway — Steam Locomotive Roster

Class	Nos	Type	Year	Construction Data
I	1-4	0-4-4-0T	1880	AE Between 1245-1278
R	1-4	2-4-0RT	1897	BP 3875-3877, 3925
S	1-2	0-6-2RT	1905	NBL 16464-16465
P	1-4	0-8-2RT	1910	NBL 19022-19025
X	1-6	0-8-2RT	1914	SLM 2456-2459, 2469-2470
X	7-10	0-8-2RT	1920	SLM 2734-2736, 2733
X	11-12	0-8-2RT	1925	SLM 3000-3001
X	13-17	0-8-2RT	1952	SLM 4069-4073

to climb under the bridge to cool off in the clear mountain stream. We also crawled under the carriages to see how the rack brakes operated: just a few teeth forced down into the rack between the frames of the carriage bogies.

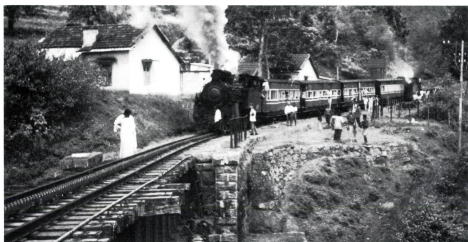
Huff and puff

On hearing a whistle blow, we headed back to the train to find out that although the loco at the rear could not be repaired successfully, the relief loco was to be put on the front. The idea was for the relief loco to work the rack section while the loco at the rear worked adhesion-style on the rails: all on 1 in 12.5!

Then the fun really began! It took a series of false starts, rolling back, frantic carriage braking (on and off) and untold whistle blowing until we moved forward. The front loco vibrated and bounced and shook the carriage we were in: then across the curved bridge we had previously walked on and into a short tunnel gouged out of the rocky hillside.

The relief engine was pushed to its limit to get the job done, and we travelled up the 1 in 12.5 at no more than walking pace. The average speed of the train for the whole trip is only 10 kilometres per hour. Not long after, a series of whistles between the two locos brought us to a halt. Both engines had to stop to raise steam in order to continue. Two more stops to raise steam were made before the journey's end.

It was here that we saw ahead of us the results of a 610-metre-high (2000ft) landslide that occurred last year in which all three road bridges, the rail bridge and a fully loaded bus just disappeared. Despite all efforts, no sign of the bus or its passengers has ever been found.



The last hill-side station stop before Coonor. There is normally only one loco per train — at the rear only, so this is a very rare photo indeed! In this case our train loco, at the rear, had broken down. The relief loco had coupled to the front of the train. Under the bridge is a river with monkeys playing among the rocks in the mist of the cascading water.

It was very disconcerting, looking past the loco towards the narrow curved bridge and to the tunnel on the other side, to see that the track leading on to the new bridge was supported by sand bags!

Again the difficult starting process was repeated and we slowly rumbled our way across the bridge, into the tunnel, past immaculate stone walls and through steep-sided mountains covered in hand-tilled tea plantations. About 2½ kilometres from Coonor, the gradient changed from 1 in 13.8 to 1 in 12.5 and again we stopped. This time the rear loco had failed completely; the relief loco had to haul the extra 76 tonnes of the now dead train loco at the rear.

To start the train, the carriage brakes were locked on to the rack and the front loco rolled back against the coil springs of the couplers and back against any slack that was in the drive unit. After synchronized whistle signals and releasing of the carriage brakes, the throttle was opened fully and the whole lot jerked and vibrated forward with the leading loco bouncing up and down, working well beyond its limits. Above the loud exhaust beats, all sorts of grinding noises and metallic clunking could be heard. It was now obvious that the rear loco had completely expired as there was no exhaust from its chimney and only some

wisps of steam from leaking pipes and the safety valves.

Coonor at last!

We jerked and blasted up the hill like this until we reached Coonor, five hours late on top of the normal time of 2½ hours. What appeared to be the entire township came out to witness the spectacle.

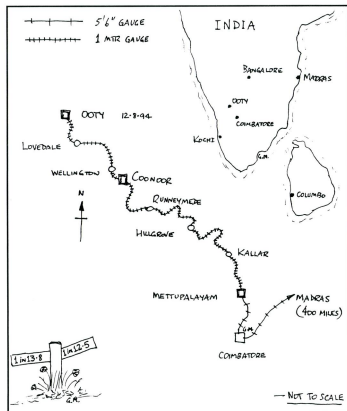
Opposite the station were three locos in steam and some carriages further behind them. Our ever-patient, non-railway enthusiast guides — one of whom had "endured" the trip with us while the other waited in a car to meet us — were understandably disappointed at the unscheduled delay, because they had arranged extra sightseeing for us between Coonor and Ooty. For us though, the unscheduled delay provided the opportunity to spend more time on one of the most scenic railways in one of the most scenic parts of the world.

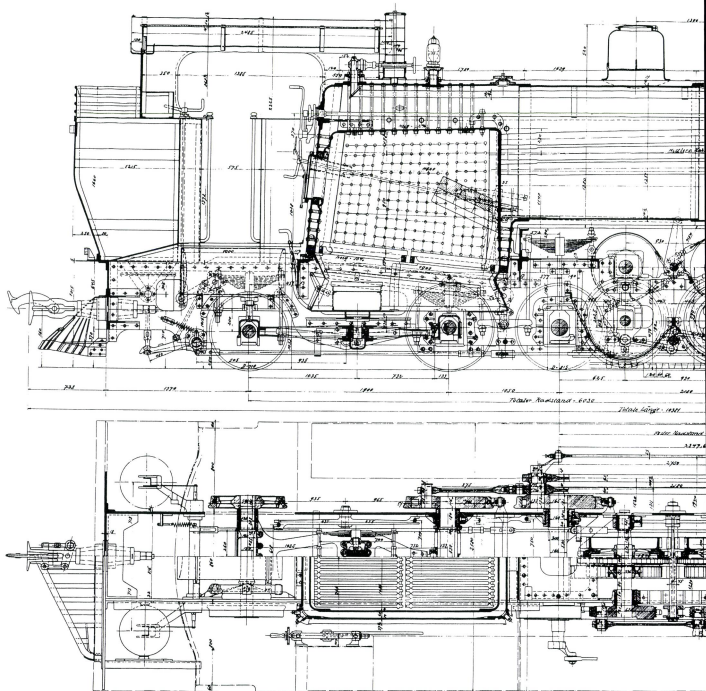
So, we departed the railway, jumped into the car and sped off to Ooty for a meal and a visit to the beautiful Ooty Botanic Gardens. (The railway between Coonor and Ooty is adhesion-only and although it reaches a maximum of 1 in 25, we had already seen the most spectacular sections).

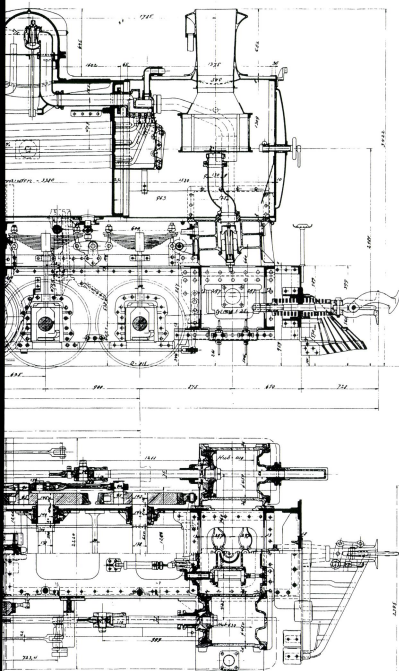
During our meal in a hotel overlooking the valley, we could smell something that was bothering us. Then it dawned! Just outside the window of the hotel were Australian eucalyptus trees, planted by the British when they developed this retreat during their days in India. Later, in a gift shop in Ooty, among the local perfumes made from Nilgiri flowers, we found bottles of: "Eucalyptus Oil, Product of India"!

Being railway enthusiasts, this eventful trip had surpassed our expectations of the railway; we'll never forget it!

Should you be looking for a great place to visit, whether railway-related or not, the Nilgiri Hills and the spectacular rack railway will not disappoint — even without a breakdown like the one we enjoyed!







Legend

Manuscript accepted

SOUTH INDIAN RAILWAY
MILGIRI WY. METRIC GAUGE
WINTERTHUR COMBINED SYSTEM - ACT RACE
TYPE D-8-B - CLASS "B"
IDENT 188/9 S. R. - CONTRACT No. 2004



The Nilgiri X class Locomotive

Nilgiri X class Major Dimensions

Description	Metric	Imperial
Cylinders:		
Adhesion; diameter	450mm	17¾"
stroke	410mm	16½"
Rack; diameter	450mm	17¾"
stroke	430mm	17"
Wheels, diameter:		
coupled	840mm	2ft 9in.
trailing	710mm	2ft 4in.
Wheelbase:		
coupled	4130mm	13ft 6⅝"
total	6030mm	19ft 7⅙"
Heating surface:		
firebox	7.7m ²	83 sq. ft
tubes	73.7m ²	793 sq. ft
superheater	22.6m ²	243 sq. ft
total	104m ²	1119 sq. ft
Grate area:	1.8m ²	19.37 sq. ft
Boiler working pressure:	1379kPa	200psi

The following information was found in *The Locomotive* March and April issues of 1915 and describes the locomotive as "recently introduced".

The 0-8-2 X class locomotive is a four cylinder compound, with all the cylinders outside the main frames, and inclined at an

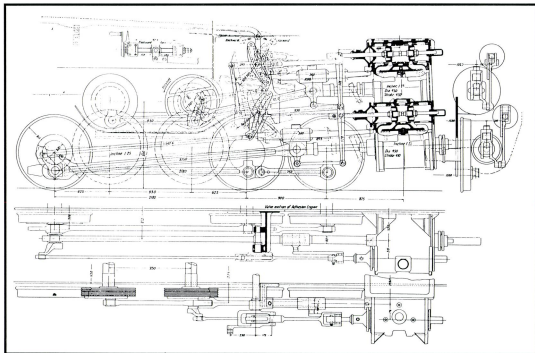
angle of 1 in 25, they are provided with piston valves with inside admission, worked by Walschaert valve gear, controlled by screw reversing gear. The lower cylinders are the high pressure and work on the adhesion mechanism, while the rack gear, driven by the upper or low pressure cylinders,

is stopped, the exhaust steam going from the high pressure cylinders direct to the exhaust pipe. As soon as the locomotive enters the rack, the driver changes, by means of steam operated valves, the direction of the high pressure exhaust, the steam passing from the adhesion to the low pressure

piston cylinders, and the rack gear begins to work. The four cylinders are of the same diameter but the rack cylinders have a slightly shorter stroke, the relation of their volume for good steam compounding being obtained by the relative dimensions of the intermediate spur wheel of the low pressure mechanism, viz., by the relation of the number of revolutions of the two mechanisms. The lower cylinders and motion driving the adhesion wheels are connected to the third pair of coupled wheels, and to avoid a connecting rod of excessive length the piston rods are considerably extended. The rack mechanism consists of two double toothed wheels and axles, supported by the main frames, driven by pinions coupled together and actu-



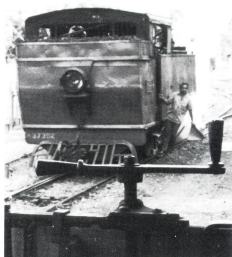
The relief loco from Coonor with crew sitting all over it!



ated by the upper pair of cylinders. It will be noticed that the connecting rods of the rack engine are fixed direct to the coupling rods instead of to the crank pins as usual. The arrangement of the steam and exhaust passages are clearly shown, as well as the position of the valves, which are easily accessible.

The general arrangement shows how the two pairs of driving rack wheels are connected by compensating beams arranged so that unequal pressure on the teeth of the rack wheels is instantaneously equalized, as, if the adhesion cylinders are doing too much work, and cause slipping, the pressure in the receiver rises, thus causing more to be done by the rack cylinders, whereby normal working is restored.

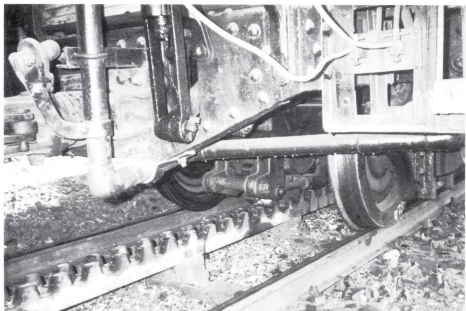
The engines carry four different kinds of brakes. The air repression or counterpressure brake used going down hill, acts on all four cylinders; a hand brake acting on the adhesion wheels; the vacuum brake for acting directly on the train, and a powerful hand brake acting on drums on the grooved pulleys of the pinion driving wheels. Brake blocks are provided on the first, third and fourth pairs of coupled wheels. For working the counter pressure brake a valve is fitted beneath the smokebox to close the ordinary exhaust. By reversing, the cylinders draw in air, and in order to counteract the heat caused by compression, water is sprayed in the centre of the cylinder, the resulting mixture being driven through the superheater into the steam pipe, whereby the



The train loco reversing to be coupled at the other end of the train.



Tending the loco at Meitupalayam.



The carriage's rack section brakes in operation.

cooling of the superheater is effected. The discharge takes place through the small pipe at the rear of the chimney, so as not to obstruct the driver's view.

The water supply is carried in two side-tanks which have a combined capacity of 1,000 gallons, whilst the bunker accommodates just over three tons of fuel. The actual weight in full working order is 48 tons 19 cwt., the maximum load on any one axle being 10 tons 8 cwt.

The boiler is fitted with a Schmidt superheater of the latest type, and a Wakefield No. 1 pattern mechanical forced feed lubricator having 8 feeds, forms part of the equipment. The sand box is on the top of the boiler.

A radial axle arrangement is provided at the rear end of the engine, fitted with side controlling springs.

The cab is well arranged with fittings, handles, etc., in convenient positions. It has a ventilated double roof.

The engines are equipped with the Jones' centre buffer and draw gear, as adopted on the Indian metre gauge lines.



Acknowledgements

I would like to thank Jim Tennant of Canberra for co-ordinating the research for the Nilgiri locomotive information. Jim contacted the Swiss Locomotive works for plans and permission to publish. He also dug up the technical information from the locomotive magazine and the Nilgiri loco roster.

Our thanks to Roger Waller of the Swiss Locomotive Works for supplying the prototype plans and permission to publish them.

The locomotive roster was provided by Dr John Davies.

The Locomotive article and X class numbers table was supplied by Hugh Hughes of New Zealand.

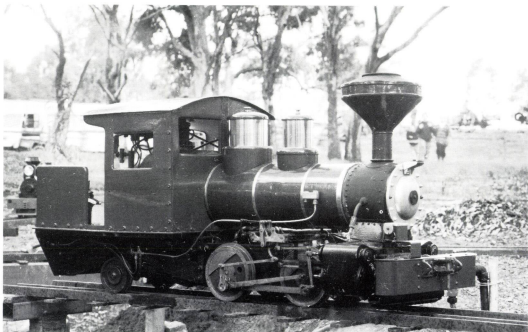


Echuca 1995

Story and photos by Phil Vergison

The 32nd Annual Steam, Horse & Vintage Rally was again held at Rotary Park, Echuca over the Queen's Birthday Weekend 10 and 11 June, 1995.

While numbers and takings were slightly down on 1994 figures, the 5" and 7 1/4" gauge Campaspe Valley Railway provided a service on Saturday and Sunday for some 1400 passengers.



Ross Walker's 0-4-2 Baldwin *Henry*.

The motive power

Ten steam and two non-steam locomotives provided motive power at various times during both days including CVR engines *Austerity* (An American design 2-8-0 for European use) owned by Chris Scott-Torr, Alf Grigg's Santa Fe 0-6-0 shunter No. 1420, Martin Rowe's 2-8-0 No. 3460 *Nigel Gresley* and Ross Walker's 0-4-2 known affectionately as *Henry*.

Henry, built for 7 1/4" gauge in 1982 by Edward Murrell of Euroa is closely based on a Baldwin designed B1 rear tank locomotive the company produced at the turn of the century for logging operations.

Since its purchase from Murray Hill in 1993 it has provided sterling service at the Echuca layout and proved itself late Saturday afternoon hauling nine adults 10 times non-stop around the track in fiery fashion! *Henry* has recently undergone a tidy-up and repaint and is booked in for serious attention to the blastpipe and steam passages in the near future.

Of the visiting locomotives, Neil Saunderson's 5" gauge 0-4-0 Hunstlet named *Noah* provided

testimony to his expertise and attention to detail.

A new railway

The Rotary Club of Echuca is keen to raise the profile of the park by extending the track to a more visible, user-friendly location near the main, public entrance. Preliminary plans have been drawn up proposing the relocation of the existing station building and the extension of the existing single line above the flood plain via a long 1 in 90 grade and crossing loop along the western bank of the Campaspe River to a balloon loop near the public carpark.

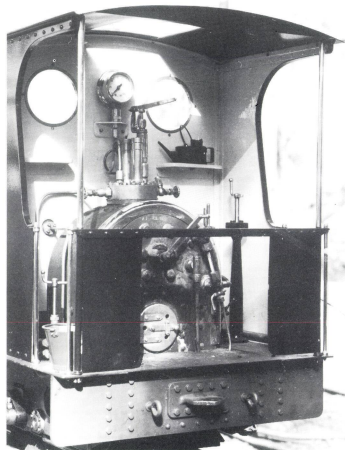
New members welcome

The Campaspe Valley Railway is an incorporated body, affiliated with the AALS and is seeking new members.

Anyone interested in joining should enquire with either Ross Walker on (054) 802911 or Alan Holding on (054) 806119 during normal business hours.



Why not plan your 1996 visit to Echuca now!



The well detailed cab of Neil Saunderson's 0-4-0 Hunstlet *Noah*.

Sand Cast Metal Founding for the Model Engineer

A practical series by Bob White

Part 1 - Patternmaking Initial Considerations

Drawings for publication by Peter Kerville and photos by the Author

This series, which will cover all aspects of sand cast metal founding, follows on from the articles on Foundry Sands (AME Issue 43, July-August 1992 page 32 and Issue 45, November-December 1992 page 35). The following is a direct result of the overwhelming number of requests to the editor for more information on foundry work relative to the model engineer.

To allude away from any reason for me needing a larger hat, I must admit that I did solicit these requests at the end of the article and I do so again now on behalf of all the other AME authors for it is by such feedback that the editor can steer the ship in the direction the majority of readers would like it to go.

Prelude

This series is intended for the hobbyist and you must forgive me, for in the main it illustrates model railways. My bent is in this direction and so these items are the most accessible for photography. I will also sneak in the occasional industrial photograph to help illustrate the text.

Sand casting is distinct from die casting where a permanent metal mould is used and is also distinct from investment or lost wax casting where the dispensable die cast wax pattern is invested into a mould by coating it with layers of refractory and then melting the wax out to form the mould cavity.

Topics that will be covered are pattern making, runner and riser systems, moulding coremaking, simple furnace construction, metal melting, fluxes, inoculation and pouring.

A series of sketches is included in this installment showing the steps taken in making a typical greensand mould for a pulley blank to give a little more insight into foundry practice and terminology at the onset rather than you having to read the series from A to Z to find out what I have been really talking about.

The drawing on the opposite page shows the sequences and the terminology used to describe the various parts of the mould and moulding equipment.

The script will be written in a hands on style for those who wish to practice in the foundry art. For those of you who have no intent to add this string to your bow of activities or, for the many readers who are simply armchair modelers I hope my efforts will give you an interesting look into what is a very creative and challenging field of engineering endeavor.

The initial considerations

Before even considering making a pattern, there are some aspects concerning it's design, intended use, frequency of use and the foundry requirements which need to be addressed. We shall now look at them in detail.

Selecting the joint line

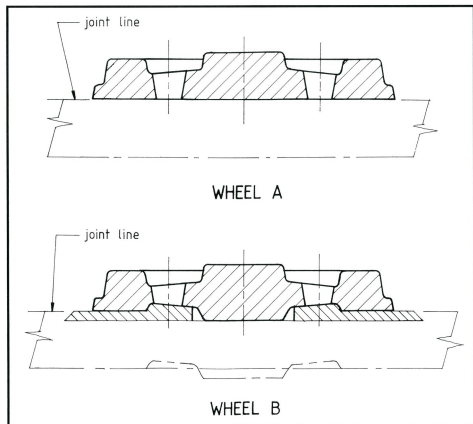
The joint line or parting line, in the case of a pattern, is the line along which the draft tapers are separated to enable removal of the pattern from the two halves of the sand mould and in the case of coreboxes, where the box is jointed, to enable removal of the core from the box.

The simplest joint is when all of the job is on one side of a flat surface, such as illustrated in the drawing of the flat sided wagon wheel. Wheel A (left) shows a section through a typical loose pattern for a 4-hole solid web wagon wheel. The photo on page 38 shows some assorted single sided loose patterns.

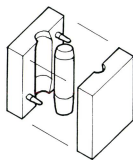
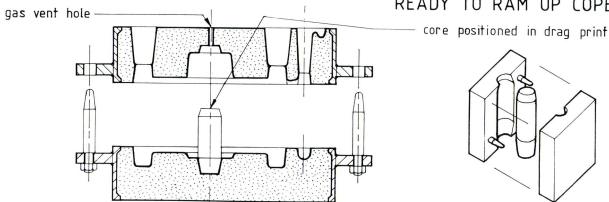
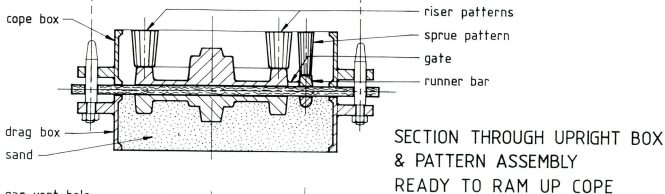
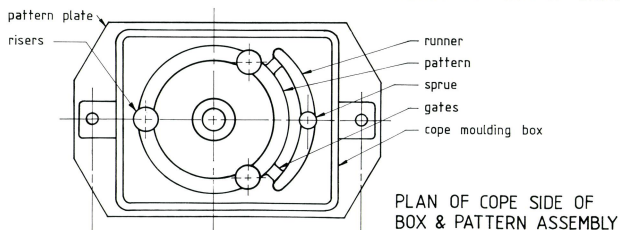
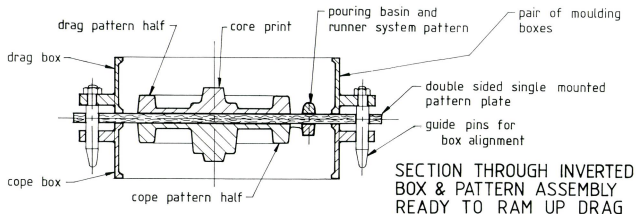
A large percentage of castings are designed with portions of the job on either side of a flat parting line. This is because it is generally much easier and hence cheaper, to construct pattern tooling with a flat joint line than it is to use a contoured joint or to have to core out undercut designs.

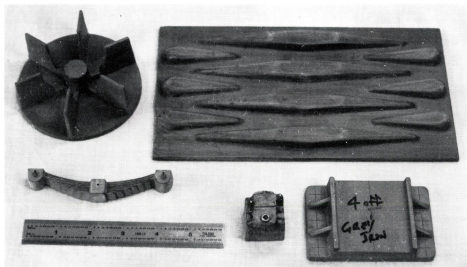
However, contoured joints are not at all uncommon. If only one or two items are to be moulded by hand from a loose pattern, they do not call for much extra consideration in time and effort to make the odd side when weighed against the freedom gained in casting design.

Wheel B (left) shows the same wheel with detail added to the back (which is more true to prototype) would require a contoured odd side to assist loose pattern moulding. N.B. If required plated, the contour would have to be on the opposite side of the plate while the pattern itself would be flat backed as in the first example.



SEQUENCES IN MAKING A GREEN SAND MOULD FOR A PULLEY





Top photo: A selection of single sided loose patterns

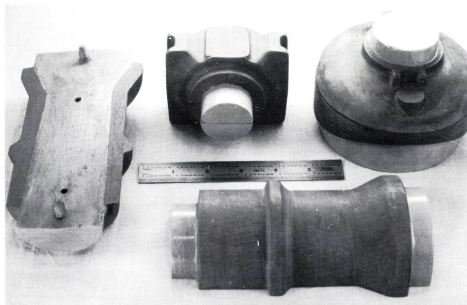
Lower photo: Split patterns with portion of the job either side of a flat parting line

Odd sides are commonly used when job moulding. They can be in the form of a shaped timber block or timber bog composite structure. This is used to support the first half of the pattern while it is moulded on a flat surface and arranged so the contoured surfaces of the job return down to the flat joint area in sufficiently shallow tapers that will allow the second half of the mould to be lifted away without sand breaking away from the joint area.

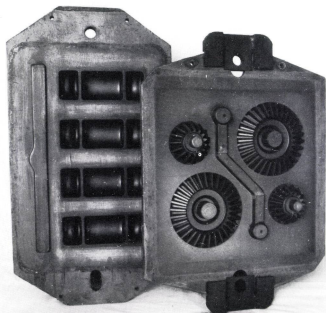
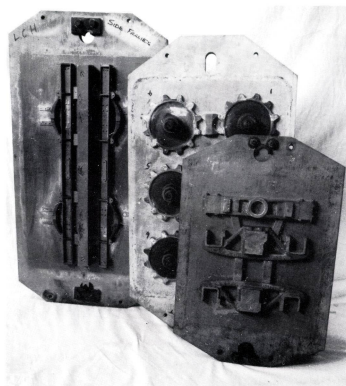
Odd sides also refer to a complete mould half that can be rammed up around the contoured pattern by the moulder and then cut away by hand down to the contoured joint line with plenty of taper applied to the surrounding mould joint surface. If multiple castings are to be made from the loose contoured joint pattern or the job is to repeat again at future dates the odd side may be made in chemically bonded or oil bonded sand and stored away as part of the pattern tooling for the job.

Loose or plated pattern?

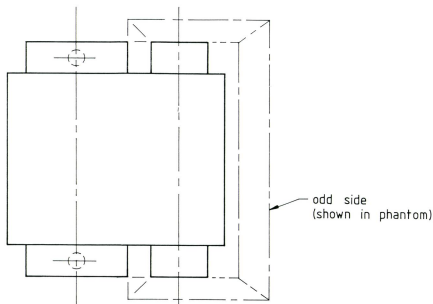
If you only require one casting off the pattern, the choice is made for you, a Loose or



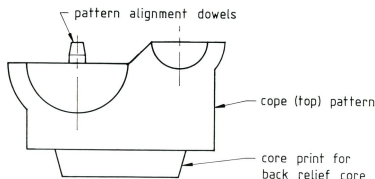
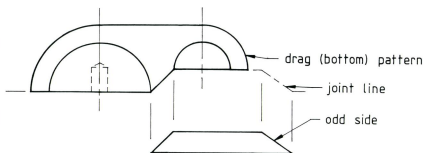
Below: Plated patterns with contoured joint lines. The left pattern is a ply plate with epoxy integral poured patterns. On the right is an aluminium plate with inserted machined aluminium patterns.



Left: Double sided plated patterns with flat joint lines



PLAN VIEW OF DRAG PATTERN



LOCO CYLINDER PATTERN

Jobbing Pattern. i.e. the pattern is termed Loose when it is not mounted on a plate or board for greensand moulding or in a box for hardsand (chemically bonded sand) moulding.

The exception to this would be if the shape of the casting necessitated a pattern of very flimsy nature. This pattern may well be much easier to construct on a backing board which then can serve as the pattern plate. An example of this, in a minor way,

will be the loco driving wheel pattern to be described later in the series.

If several of the one item or several items of similar size and in the same metal are to be cast and the joint lines are flat then a plated pattern will be worth considering.

Commercial consideration for the plated pattern

Those of you who may want to make your own patterns and have them cast by a commercial foundry will need to understand the

Notes on the Loco Cylinder Pattern

In this case, the loco cylinder pattern would be a loose wooden pattern and a wooden odd side

• Drag Bottom Pattern Half

The drag is drawn on top in this instance, as this half is moulded first off. It then becomes the drag mould

• Odd Side

This supports the drag pattern for moulding and returns the joint line back to a flat surface for loose moulding. The odd side is then removed before positioning the cope pattern.

• The Cores

The cores for the valve chest and main cylinder could be from foundry stock round cores, thus eliminating the need for core-boxes.

• Core Print for Back Relief Core

The core itself could be filed up (with an old file) from a piece of discarded block core from the core print of a larger casting, thus saving the need for a core box. Alternatively, if not too deep, the detail could be self moulded off the pattern.

The core would be lightly nailed or wire sprigged in position. As the mould is filled (during pouring), flotation takes over to retain the core in position

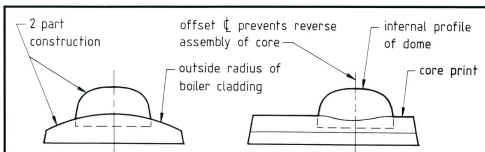
cost structure and the need for "patterns on a board" more than the backyard founder working in his own time.

First up, very few foundries today employ people at moulding floor level who are skilled in working with a loose pattern for such tiny work as ours. Your beautiful pattern is liable to come back split in two by an oversized lifting spike, or even worse, lost in the floor sand before it ever had a mould made off it.

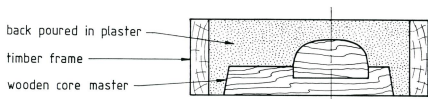
Next, labour and overhead costs total around \$40 per hour and it could take three quarters of an hour or more to find a suitable small box, hand ram up one off in a mould, hand cut in the runner system, close and weight up your job ready for pouring. Fettleing time and metal cost would then come in on top of this.

The plated pattern on the other hand may only take ten minutes of semi-skilled labour to machine mould in a standard box. If it is multiple moulded with four wagon wheel impressions or three or four other small items, complete with a runner system, the job is not only more attractive to the foundry, as it presents less supervisory hassle, but represents a considerable saving when you affront the bill.

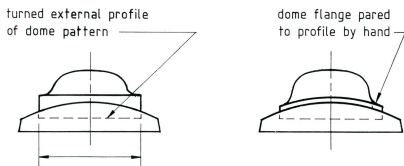
Safety First in the Foundry ALWAYS



① CONSTRUCTION OF WOODEN CORE MASTER

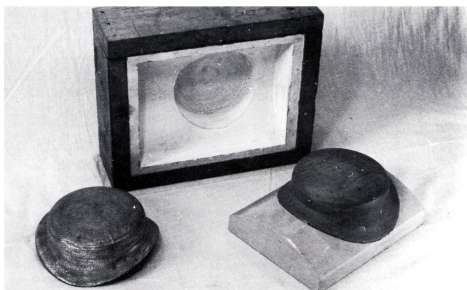


② PRODUCTION OF CORE BOX (SHOWN IN SECTION)



internal profile removed and
core print register cavity
bored out to take dome pattern

③ CONVERSION OF CORE MASTER INTO PATTERN



Self coring or cored design

Many shapes can have their internal surfaces self cored, that is, the area is created as part of the mould just as the outside surface of the job is. Examples of this are ring or flange shaped objects.

However, there is a limit in the ratio of cross sectional area to depth of pocket that can be drawn by the mould from the pattern without the sand clog fracturing and remaining stuck in the pattern.

It is then that the use of a core, a separate self supporting block of chemically bonded sand made in a core box quite separate from the pattern, becomes inevitable.

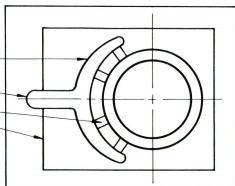
The bore in the pulley illustrated is an example of this. If the boss were short and the bore large it may have been possible to be self cored as part of the mould. Alternatively, for our work where numbers are low, size is small and labour our own, it may simply be easier to cast the boss solid and machine out the extra metal. However feeding of liquid metal to these resultant heavy sections of the casting during solidification must also be taken into consideration.

Some internal shapes and indeed external ones also, leave no option but to use a core. When designing such shapes you must keep in mind that core boxes are more difficult and take longer to make than patterns of similar detail for their surfaces are all in the female form, that is internal. You have to be able to twist your brain inside out and then back again before you start because the core is the reverse of the finished cast shape and the core box is the reverse of the core.

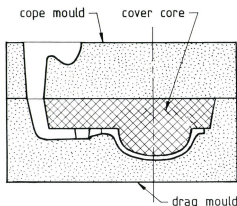
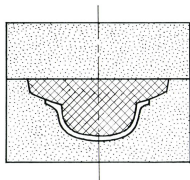
Other shapes yet again are ideal for self coring if only we could make the pattern strong enough to withstand the rigors of moulding. The dome cover in the photo is an example of this. If a casting this thin were required in sufficient quantity commercially, a pair of pattern plates would be made with half the impression in each plate. The job would be multiple mounted and epoxy resin would be used for the pattern profile contoured joint surface. Dependent on the position in the volume scale, moulds could be produced at from 8 to 320 per hour with pattern costs ranging from one to several thousand dollars respectively.

In our case where only one or two castings are required the job is designed to use what is termed a cover core. The illustrated example used a timber pattern core master and a plaster of paris core box, in all, requiring most of a weekend to make the tooling and about another hour to make the casting.

runner
sprue
gates
core print outline



PLAN ON DRAG MOULD CAVITY
detailing hand cut sprue, runner & gates



SECTIONS THROUGH MOULD ASSEMBLY

DOME COVER MOULD CONCEPT

About the Author

Bob White began making simple aluminium castings in his backyard when an apprentice metal machinist. The transfer from backyard to formal business premises came soon after he completed his trade training, with the principle items of plant being a Myford lathe and a home made, sump oil fired, crucible furnace.

His business now produces castings in aluminium, bronze, grey and ductile irons and plain carbon and alloy steels for a diverse range of industries.

Bob is an active model engineer in the 5" gauge railway field with a leaning towards the total railway scene from locos and rolling stock to civil works and lineside structures. He hopes to write further articles on these topics.

He was one of several people instrumental in rebuilding the AME magazine and has served on its board of directors since the reformation of its ownership.

What's next?

The next part will move on to selection of materials, tapers and fillets, contraction allowance, shrinkage and later on we will get down to some hands on work with the tools and machinery.

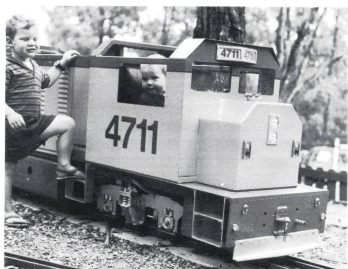
To be continued ...



A Little Loco?



1. The young driver eases the train to a stand, keeping a close eye on the brake pipe pressure, and being prepared to stop short of any obstructions.



2. "Great", he mumbles to himself, as he notes he is to be relieved on arrival. "I see you're late again" says the relief, checking his watch. "It's hard to get good help these days!" The relief says as he prepares to board for the changeover.

Note the safety boots issued to the '90s driver — a sign of the times, or part of the current stringent economic measures?

Cobden Rotary Miniature Railway

Cobden — the location of the 1997 AALS Easter Convention

Story and photos by Murray Hill

Cobden is a small dairying community with a population of 1600, situated 210 kms South West of Melbourne and 55 kms East of Warrnambool.

The prospect of building a miniature railway by the Rotary Club on the site of the former Cobden racecourse, was first mentioned by Rotarian Alan Hart at a meeting in June, 1993. Support for the idea was forthcoming from Rotarian and model engineer, John Wiggins, owner of a 5" steam loco and builder of a 7 1/4" steam loco. The concept was enthusiastically supported by the Rotarians and a visit was made on June 30th, 1993 to miniature railways at Altona North, Tullamarine and Box Hill under the guidance of Murray Hill of the AALS. The object of this visit being to investigate various methods of track construction and design before making a decision on which way to proceed. The club wanted to ensure that the best possible track was built with the minimum expenditure in time, labour, money and material. A number of Rotarians and South West Model Engineer members had also visited the Wagga Wagga railway Park.

A big project

The building of the Miniature Railway Park was adopted as a Rotary Club project for the 1993/94 year under Club President Alan Hart. An early meeting was held with the South West Model Engineers, led by John Wiggins with an active membership of 14, including local earth moving contractors (and train enthusiasts) Gordon Rudolph, of Timboon and Kevin Molan, of Terang. The efforts of these two in establishing the track layout and building the earth works was the main reason things moved so quickly. The embankment was formed, the lake dug and car park formed in quick time and along with local farmer and Rotarian Geoff Denney many, many hours of time, expertise, equipment and material were donated and the track rapidly took shape, after the first sod had been turned on 10 February 1994. The track plans were drawn by John Wiggins, the points were also

made by John Wiggins as was the turntable, steaming bays etc., with Alan Hart handling all the paperwork.

A proposal was put to the Shire of Heytesbury in August 1993 to build the track, seeking a loan and asking for a one off grant. The application was successful which led to increased effort by all concerned with the Railway Park.

Local bricklayer Ritchie Jehu built the station with bricks donated by A. J. Welsh & Sons of Warrnambool. Plumbing was done by locals, T. S. McQuinn & Son and timber work and carpentry by local builder and Rotarian Brian Malden. Electrical work was arranged by Rotarian Ian McArthur who also made the three slot saw bench to cut the 75mm x 50mm treated pine sleepers. The "slotted sleeper" method of construction made for quick, easy and cheaper method of track construction. The club's newest Rotarian Ron Merigan was the general hand who pitched in everywhere to help.



Looking West from the top of the bridge.

Local support

Club and community support and enthusiasm was tremendous and work went ahead at a frantic pace with working bees almost every weekend enabling the oval track of 5" and 7 1/4" gauge and approximate length of 330 metres was ready by mid May, 1994. A sponsors and supporters day was held on Sunday, 22 May 1994 to show the appreciation of the Rotary Club and the South West Model Engineers. The day was a great success and received positive publicity alerting the public to the existence of the Miniature Railway Park at Cobden.

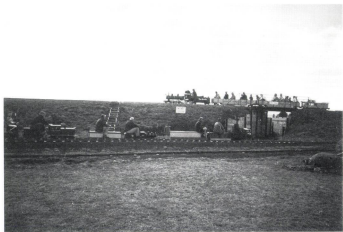
The track, complete with new brick Railway station was ready for public running by June and the official opening of Stage one was held on Sunday, 19 June 1994 before a large crowd. Rotary District Governor Dennis Wilson declared the track open after speeches by the Rotary Club President, Alan Hart, Shire of Heytesbury President Cr. Alma MacDonald and AALS Victorian Branch Presi-



A train load of happy passengers.



Steaming bays and turntable.



*A good view of the overpass.
I won't comment on the bunched-up trains!*

dent Murray Hill. Once again the weather was kind and the day was a huge success, spurring Rotarians and Engineers alike into greater activity, so much so, that with relatively fine weather in July that a great deal of rail was laid around the embankment up to the bridge.

Track opening

The entire track was first opened to the public on Sunday, 16 October 1994 a phenomenal effort. A great deal of landscaping had been done and hundreds of trees planted to complement the track layout.

The opening of Stage two was held on Sunday, 18 December 1994 on a fine day before a large crowd by Federal MHR Mr Stewart McArthur. Many activities were available on the day — radio controlled boats on the lake, a model aeroplane display, model trains, static engine display, a slot car track, a magic castle for the young ones, a chip drop and a visit by Santa plus train rides galore!

The 1994/95 Rotary Club President Kevin Johnston has carried on the work started dur-

ing Alan Hart's term of office and hopes to adopt as a major project the restoration of the former Cobden Railway Station now sitting on the track opposite the lake. It's hoped that the work will be carried out by the building students under Kevin's supervision from Cobden Technical School.

Open for business

Public running days are on the third Sunday of each month and a successful canteen has operated due to the hard working ladies of Rotary and friends.

Birthday parties, break ups and all occasions are catered for upon request. To date Kindergartens, Scouts etc have made a visit to the Railway Park as well as Rotarians hosting visiting Clubs to enjoy and evening on the tracks.

The Railway Park has been an unqualified success to date as word of its existence spreads. Monies made at present are put back



*The driving force of the Cobden Miniature Railway.
Left: Alan Hart, right: John Wiggins*

into further development of the Park. A toilet block is about to be constructed, a carriage shed erected, a tunnel built, a gazebo built along with picnic tables and chairs and the restoration of the old Railway station.

Almost 4000 rides have been sold in the first nine months of operation, proving the popularity of the Miniature Railway Park.

All visitors, with or without locos are most welcome at the Park, to run, view or ride the rails at Cobden. A track of 1 km built inside a year!

The Rotary Club of Cobden chartered in March 1966 has 24 members and is active within the local community. Also operating in the general area for the past 10 years is The South West Model Engineers, a club having members from Cobden, Timboon, Terang, Warrnambool and Colac.



All Aboard! A view of the excellent station facilities.

SLSV Small Gauge Revival

By Bill Chalmers

During 1994, several members of the Steam Locomotive Society of Victoria (SLSV) talked about the rare appearance of smaller gauge locos, especially 2½" gauge. This led to the idea of running a weekend gathering for locos ranging from 1¼" to 3½" gauge — with 5" gauge to be tolerated!

So the Small Gauge Revival planning began, with the formation of a sub-committee headed by John Auty, then SLSV Vice-Presi-

dent. Brochures and invitations were produced by Frank Clark using his computer expertise, and these went out to clubs in every State. Enthusiasts were invited to come to Moorabbin for the Victorian Labour Day Weekend, Friday 10th to Monday 13th March 1995. Responses were slow at first, but early worries proved unfounded in the end as acceptances poured in.

Friday 10th saw the arrival of contingents from NSW and Queensland. Hugh Elsol flew down from Brisbane, bringing his recently completed 3½" gauge LNWR 2-4-0 *Precedent* class based on the LBSC *Mabel* design. This excellent loco ran very well all weekend and is a credit to Hugh. In the meantime, David Hemphill arrived by car, also from Queensland, and proceeded to unload his 3½" South Australian Railways 500 class 4-8-4. This loco, to David's usual high standard of construction, performed faultlessly and was to take out the trophy for the best-presented exhibit of the meeting — a popular choice. Other interstate visitors came from the Hornsby and District MES Mark Stapleton, 5" *Nigel Gresley*, and Reg Watters, 5" *Manor* and from Illawarra Live Steamers, Mark Robinson 5" C36 and 3½" *Mountaineer*, Helmut Ecker 5" *Maid of Kent* and Mark Chapman 5" *Netta*.

Visitors came from many Victorian clubs to swell the numbers for the weekend to 182, with 32 locos, several stationary and traction engines, vintage 1¼" steam, and a range of 1¾" steam and electric displayed and operated by Neil Riches. Regrettably, one objective was not achieved in that no operational 2½" locos were present, although several were on static display in the marquee, together with several larger



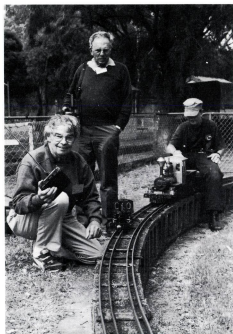
David Hemphill exits the tunnel at speed behind his 3½" SAR 500 class 4-8-4 with Keith Hartley as passenger.

Photo: Bill Chalmers

locos, some part-built.

The SLSV elevated track, of some 610 metres length, was restricted to 3½" locos until Sunday, but the 5" ground level was kept busy in the meantime, while the vintage 1¼" locos tried out the smaller elevated track, an oval having 1¼", 2½", 3½" and 5" gauges. Several visitors commented on the pleasure of being able to run on a long, solid elevated track, one of the few now left in the country, unfortunately.

Continued on page 55



Peter Stuart (left) with his 1¼" scale 0-4-0 by Roundhouse of UK, while Martin Cord waits with John Campbell's 3½" Porter 2-4-0. Keith Hartley is an interested onlooker.

Photo: Ken Rofe



John Campbell at the throttle of Bill Chalmers' 3½" LNER 4-6-2

Photo: Bill Chalmers



The steaming bay: Hugh Elsol's (QSMEE) 3½" LNWR 2-4-0; Cliff Kirby's (CSMEE) 3½" GWR 4-6-0 and John Brown (SLSV) with his 3½" LNER 4-6-2.

Photo: Ken Rofe



Workshop and Technical

Counter-boring Tools

By Doug Mellor

Drawing for publication by Ken Gifford

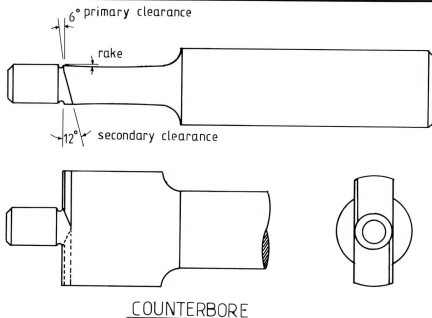
In model engineering there are numerous applications where it is useful to be able to perform the counter-boring operation. I make my own counter-boring tools, and I have found them to be effective for working on steel, brass and gunmetal. While building my 3½" gauge C36 loco, I used counter-boring tools for spot facing cylinder and steam chest covers, coupling rods and I have also found the tools excellent for halving the thickness of coupling rods to form the knuckle joint.

Normally I would make a counter-boring tool from silver steel stock. If, however, a really large tool is required, steel bar as supplied for reinforcing concrete can be used as this material also has good hardening qualities.

In designing the tool, two dimensions are fundamental. These are the diameter of the pilot spigot and the diameter of the counter-bore required. For absolute accuracy, I always drill the pilot hole in the model component and then re-measure the finished hole to ascertain the correct spigot diameter. In practice, I turn the spigot to the hole size less 0.002". I would normally make the spigot one diameter long. The outside diameter of the tool is machined at the same time and is the diameter which you require for the counter-bore on the model component. I normally machine a waist on the shank prior to parting off the tool to the desired length — strictly for show — on tools larger than ¾" counter-bore.

The cutting edges are next to be prepared, and some patience is required. I use the following procedure — refer to the sketch:

- File two parallel faces on the counter-bore diameter equally spaced from the centreline of the material, and leaving a thickness of material slightly greater than the spigot diameter.
- The parallel faces are now hollowed using a half round file. The angle the hollow makes with the spigot diameter forms the rake angle of the tool. If you intend to counter-bore brass, you may prefer to leave the faces flat and retain a rake angle of zero.
- Using a 4" half round file with fine teeth, a clearance is produced behind the cutting edge. The clearance should be made to slightly undercut the pilot



spigot diameter so that the tool will be capable of cutting right across the counter-bore with no radius at the pilot hole. It is wise to provide a primary and secondary clearance as this will assist in the sharpening operation after the tool is hardened.

The cutter is now in its final form but is to be hardened and sharpened. The silver steel can be effectively hardened using this sequence:

- Heat the cutter until it is bright red. Ensure that it is heated right through, which may mean holding the item at this temperature for about thirty seconds.
- Quench vertically in water.
- Clean up one of the curved faces with a slip stone to allow observation of the temper colours.
- Gently heat the tool near the shank and increase the temperature until it is a pale straw colour at the cutter end of the tool.
- Quench in water.

The hardening is now complete and the tool should be cleaned up, using fine wet and dry paper, to remove the black oxide around the shank and pilot spigot. The sharpening operation can be undertaken by carefully using a slipstone, or for those who have one, a diamond lap which allows you to hone very closely to the pilot spigot diameter. (I have one, purchased cheaply many years ago and it is still fine).

When using the cutter, I choose a cutting

speed ranging from ⅓ drilling speed for steel to ⅔ for softer materials. I recommend generous doses of coolant while operating and you will be rewarded with long tool life and an excellent surface finish.



Save the Coal

Correct boiler water level is inseparable from good firing practice. Adjust the injector to supply the minimum quantity of water required to maintain the correct water level while the engine is steaming.

The essential features in the economical handling of coal are:

- (1) High firebox temperature.**
- (2) Regular supply of feed water when steaming.**

*Reprinted from:
Handbook of the Locomotive, Victorian
Railways 1951.*

C. H. Wear collection

A Cheap Rotary Table Alternative

By Gerry Bailey

Photos by Iain Bailey, drawing for publication by Brian Carter

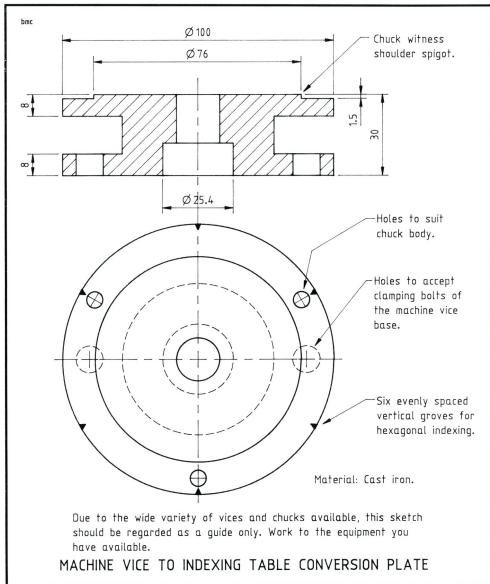
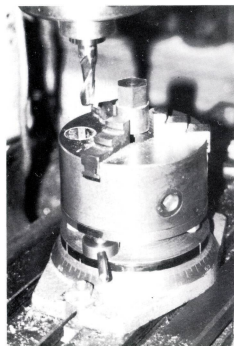
This short article explains how an indexable machine vice can be adapted to become a quick release rotary table for machining a hexagon and indeed any other "gon" shape with a little care.

The inspiration for making this device arose when I had to return a magnificent unit borrowed from a very good friend. This prototype unit had what I call an automatic position finder and cam action clamps. I really did not want to return the item but my conscience reminded me that I should not covet another's indexing table! Having returned it I was considering my position when my eyes lighted upon the precision machine vice on the mill table and suddenly a problem was overcome!

Photo 1 shows the finished unit secured to the mill table — it had just been used to mill a hexagon on a piece of brass. The unit has also been used to mill hex heads on steel bolts: I'm certain this device will pay its way.

Photo 2 shows the various components: the vice base is on the left, the adaptor plate, with the chuck on the right. The clamp nuts with screwed handles and the nuts to secure the adaptor plate are in the foreground.

The major item to be machined is the adaptor plate. The dimensions shown on the drawing are for my situation, please check your equipment dimensions before manufacture. The main consideration is to keep the height increase as small as possible.



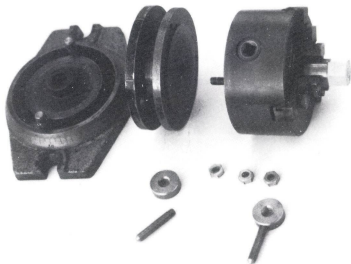
ble. Make the adaptor plate as thin as possible, without sacrificing strength.

The six indexing registration marks on the adaptor plate are marked off from the protractor graduations on the base plate.

When indexing, the six lines can be used

for quick hexagons, or use the degree graduations on the base for other divisions.

This device ranks highly among the items in my workshop, and I am sure that anyone with the appropriate vice and a spare chuck would not regret the time taken to build.



Water Gauge Bush Alignment Jig

Story and photos by

Peter Dawes

It is important to align the two boiler bushes that are destined to the mount the water gauges. Glass tube is not very tolerant of misalignment. A certain amount of bending of the soft copper of the backhead can fine tune the alignment but if either bush is very close to the edge of the flange it needs to be supported during soldering. So a simple jig made of $\frac{3}{4}$ " and $\frac{1}{4}$ " bright mild steel will hold them during the soldering. The jig consists of five pieces plus four setscrews (see photos).

The body pieces

Make two body pieces about $1\frac{3}{4}$ " long by $\frac{3}{4}$ " diameter. In the lathe, drill one end of each piece concentrically 1" deep by $\frac{1}{4}$ " diameter for the screwed rod. Start the drill with a centre drill or by turning a dimple because

the hole must run true. Also cross drill each piece about $\frac{3}{8}$ " from that same end for a set-screw, e.g., No.8 for $\frac{1}{4}$ " Whitworth or whatever size you use.

Also cross-drill both pieces $\frac{1}{4}$ " for the cross bar, but $\frac{1}{2}$ " from the other end. These holes must be drilled accurately at right angles to the long axis of the body pieces so use Vee-blocks to position the job on the drill press table. Also drill that end axially in the lathe No.8 and tap for another $\frac{1}{4}$ " BSW set-screw to lock the cross bar. If the $\frac{1}{4}$ " rods are a tight fit in the holes, ream the holes, but they shouldn't be loose.

The screwed rods

There are two of these — $\frac{1}{4}$ " diameter by $1\frac{3}{8}$ " long. If the bushes are screwed $\frac{5}{16}$ " then use that size rod. Alternatively you can use brass rod for these two pieces. Because the rods screw into the bushes to effect alignment, the threads must be cut true in the lathe or the whole point of the jig is wasted. Start the thread in the lathe and finish it to size with the appropriate die.

The cross beam

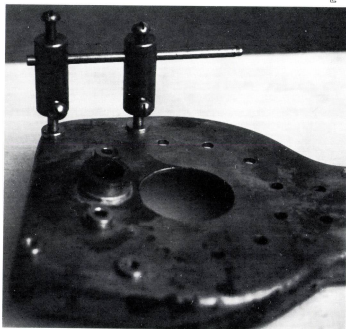
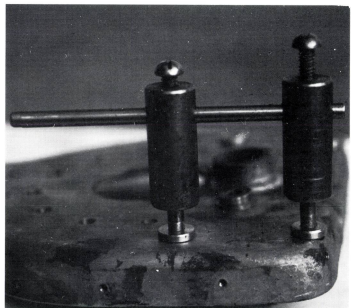
This is just a straight piece of $\frac{1}{4}$ " bright mild steel about 3" long, (i.e. long enough to span the distance between the bushes). You could also use $\frac{5}{16}$ " rod if you wish — just drill the various holes to match.

To use the jig

Flux and fit a bush in each hole in the backhead. Screw a rod into each bush. Place a body piece over each screwed rod. Feed the cross piece through the cross holes and lock it with the body pieces parallel to each other (by sighting along their sides). This means the bushes will be aligned and parallel in this plane. Tighten all four screws.

It is the other plane that is the more critical one and the bushes are true in this plane automatically simply because the axial holes were drilled true in the lathe and the screw threads were lathe-cut.

Because the jig is left in place during the "heat", make sure you do not get flux or solder on it. Dismantle the jig and set it up again for the water gauge on the opposite side.



A Simple Collet

by Ted Murrell

Turning small rods in a three-jaw chuck is often difficult. Sometimes the rod is not supported between the jaws and becomes three-sided when machined. A collet is the answer, but expensive. I use a simple one that is doing a good job.

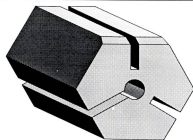
A 25mm length of 20mm AF mild steel hexagonal bar is placed in the chuck — level with the front of the chuck jaws, face off and carefully drill and ream the diameter hole required. Put a chamfer on the end of the hex bar, between jaws one and two, so the collet can be removed and replaced in the same position in the chuck.

Remove the hex bar, grip it end-wise in the vice and hacksaw a slot through to the hole. Select a flat side that is exposed between the chuck jaws.

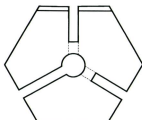
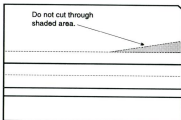
Use a chisel to open the slot slightly so that the rod is free in the hole. In use, this will allow the collet to release the rod, but remain captive by the chuck jaws.

Two more slots are cut through to the hole, but leave some material at the front to keep the collet in one piece.

I have used these collets to screw cut stainless steel piston rods!



bmc



QSVMS Classic Steam and Power of the Past Rally 1995

Story and photos by Dave Harper

The Qld Steam & Vintage Machinery Society's rally held over the weekend of 3rd and 4th June at North Pine Country Park, Petrie was a huge success — everyone had a good time, and we ended up making a modest profit. However, we had more than our fair share of trials and tribulations with several last minute cancellations, threatening weather, and the occasional traffic jam during the Grand Parade!

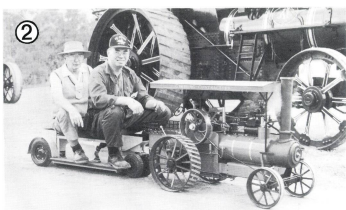
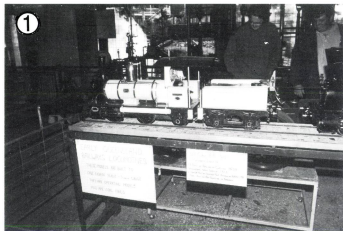
All this came on top of uncertainty caused by a new local council being elected and the loss of Australian Army sponsorship for transporting large engines in from surrounding areas. These factors were of course unknown to most of our exhibitors and the visiting public, so they all seemed to be happy even though the Rally Committee were reduced to nervous wrecks!

On the modelling side, which was my baby, things went fairly smoothly. The centrepiece of the model display was a unique collection of 5" gauge, 1/4th scale QGR locos put together by Neil Mackenzie and friends. Even here we were disappointed in not having a model of the Beyer-Garratt, but we had Ray Schilling's A10, a B12 built by Eric

Evans and Neil Mackenzie's A12 and his unfinished AC16, plus Jimmy Jackson's PB15 and Kenny Saunders' unfinished A12. These were all set up on stands down the centre of our shed and made a fine display. The two part-built locos were hooked up to an air compressor and were run regularly. Even here the gremlins burnt out the compressor motor in the first hour!

Photo 1 shows the A10 heading the line-up. Unfortunately, the other locos being mostly black, they don't show up well in the photos! We didn't have so many model traction engines this year either, but Gordon Blake from Inverell was a most welcome visitor with his Cliff and Bunting, which he ran along with Hugh Carseldine's similar machine. Unfortunately, Gordon's model developed a problem, so they spent the rest of the weekend trundling around behind Hugh's. **Photo 2** shows Gordon in front and Hugh behind waiting for the Grand Parade to get under way.

Photo 3 shows the scene again with Chris Wilson on his Sentinel Steam Wagon in front of the 1900 Marshall 'Jennifer' and



the 1903 Buffalo Pitts belonging to Michelle Buchanan.

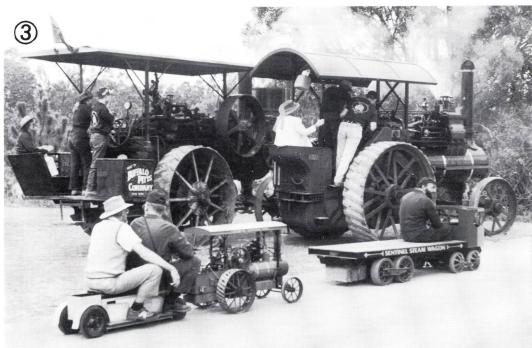
Photo 4 shows the achievement of the day, installing Pine Rivers Shire Mayor, Yvonne Chapman, in the tender of Jennifer! Good job she burns wood, not coal! (Jennifer that is, not Cr Chapman.)

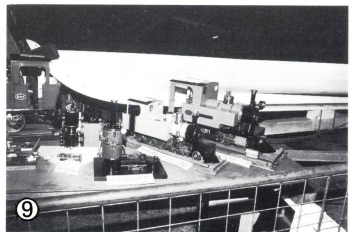
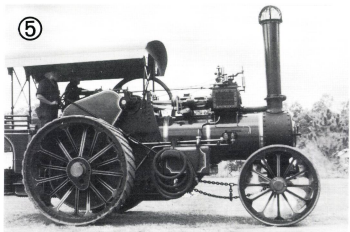
Photo 5 shows the beautifully restored Garrett traction engine belonging to the Queensland Museum.

In the main machinery area Tony Buchanan's Robey portable was busy driving Bob Bone's threshing machine, **photo 6**.

Photo 7 is a close-up of Chris Wilson's Sentinel. This scratch-built model has a twin cylinder engine under the flatbed driving through a mini-minor gearbox and chain to the dual rear axles. The coal fired vertical boiler is fed through the top just like the prototype.

Back in the shed two locos by Derek Gill are shown in **photo 8**.





In front is an O gauge steamer while behind is the Lion built from ME plans.

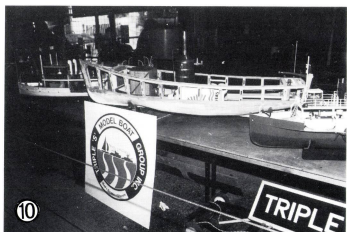
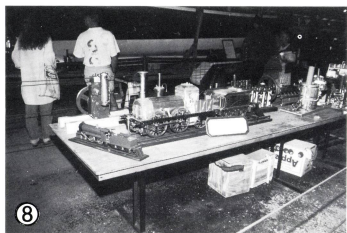
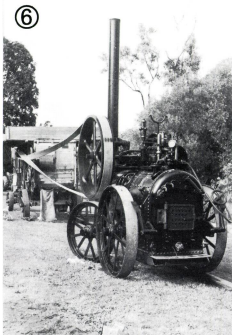
Ron Harris had his usual collection of superb models brought down from Nambour, **photo 9**. I was particularly interested in the model Westinghouse pump. Ron has promised that we'll combine

on an article giving all the details, which I plan to keep him to!

Finally, our friends from the Triple S Model Boat Group brought along a selection of their steam powered models. Ken Douglas' latest effort in **photo 10** looks like he's eliminating the radio problem. He could just

about sit in it and steer it! It's an open launch with a vertical boiler. Under the dummy coal in the bunker lurks an LPG cylinder. I think a Stuart twin 10 is planned for power.

So, another rally is over and we're already planning next year's, we really must be gluttons for punishment! Still, it's worth it to meet so many good people who all have a liking for machinery of one sort or another, and our thanks go to all those who make it worth while.



Prototype Boiler Repairs

Part 1 — Procedure for a Boiler Inspector's Examination and Test of a Locomotive Boiler on the Victorian Railways

By Doug Baxter

All inspection and washout plugs have been removed plus the following: syphon and/or arch tube caps if applicable, barrel inspection plates (only on three stroke boilers), dome cover and if applicable the surge plates in the dome, regulator stuffing box and if the boiler can be entered via the dome the pin retaining the regulator rod to be removed and regulator rod pulled back, blow down cock removed and the fusible plugs removed and replaced with the spare set of plugs.

All ashes removed from the grate, the firebox walls and tube plate lightly brushed down with a banister brush and the row of rivets retaining the smokebox tube plate brushed down with a welders wire brush. If a barrel angle ring was used to attach the smokebox tube plate the coping covering it was slightly released and prized back to expose the rivets.

The boiler had been thoroughly washed out in the correct manner, namely commencing at the crown of the firebox, sides of the firebox, tubes from the barrel hole then the bottom of the barrel from the smokebox tube plate, syphons and/or arch tubes if applicable and finally around the foundation ring finishing across at the throat plate.

Inspection

The Boiler Inspector had two mirrors, one was a $2\frac{1}{2}$ " x $3\frac{1}{2}$ " for hand holes, regulator stuffing box hole, etc. while a $\frac{7}{8}$ " x 2" mirror was used for the inspection or washout plug holes. Both mirrors were framed in very thin gauge plate to which was soft soldered a suitable handle about 10" long. A 6" x 6" mirror was available at the depot for inspection via the dome if ingress to inside the boiler was not possible. The handles of all these mirrors were copper to allow for easy movement of the angle of the mirror. An 8 ounce engineers hammer was essential for sounding stays and a small file to ascertain if the tubes were brass or copper.

Let there be light

Each locomotive depot had an acetylene light which consisted of a galvanized dipper and a cone. For the uninitiated, the dipper was about quarter filled with water, carbide placed in the cone via an inch diameter hole at the top of the cone and into this hole was placed a wooden plug covered with light hessian. At the centre of the base was a $\frac{1}{4}$ " diameter tube soldered in, the cone was placed in the water in the dipper wooden plug down, the water seeped up the hessian to the carbide which when it became damp gave off acetylene gas. A six foot hose was attached to the $\frac{1}{4}$ " tube

and at the other end was a two foot length of $\frac{1}{4}$ " brass tube to which an acetylene burner was screwed in. When ignited the acetylene burned with a bright white sootless flame about $1\frac{1}{2}$ " diameter and lit the inside of the boiler up as clear as daylight.

There was also an Aladdin lamp or as it was sometimes called a slush light, operated by kerosene and a kerosene torch, a four foot length of 10 gauge wire with an asbestos knob on one end. A battery torch, electric lead light and a stick of yellow waterproof crayon were also available.

Boiler expansion

Firstly observe if the boiler is expanding its correct amount while under steam. Being cold the boiler will show distinct movement, on the side irons of narrow firebox boilers or the expansion slides below the throat plate on wide fireboxes. This distance varies with the size of the boiler: $\frac{3}{16}$ " for D3 and K, $\frac{1}{16}$ " for A2 and C, $\frac{1}{16}$ " for the larger boilers S, X and R and finally $\frac{1}{16}$ " for the H class boilers. If expansion is not taking place then the boiler is said to be hogging its back, so as you go along look for these problems which show up as grooving in the upper area of the throat plate. While still on the ground use the acetylene light to look across the water space at the throat plate, in some class of locomotive it will be necessary to have the wheels placed in the correct position so that the inspection hole at the corner of the throat is not obscured by the balance weight or a wheel spoke. Using the small mirror look up the radius of the throat flange since cracks develop here in copper fireboxes, and also to make certain the spaces are clear and look for necking of stays. With the light withdrawn to just inside the hole and using the small mirror in the plug hole centre of firebox side under the foot plate see if all is clear, then put the light in this hole and using the mirror look for saucering around the stays. This area is known as the hot spot with saucering up to $2\frac{1}{2}$ " diameter occurring and eventually going in deep enough to cause the stay to leak on the fire side. This procedure is to be carried out on both sides and if on a wide firebox type, the blowdown cock is usually fitted on the right hand side, look carefully in and around the opening for wasted studs and pitting on the face, both caused by a leaking joint. Broken stays adjacent to the blow down cock are quite prevalent due to the hammering action of opening and closing the blow down cock.

Your assistant places the light in the plug hole under the foot plate while the Boiler Inspector climbs up into the cab and looks down the hand hole to see if all is clear since it is possible to have blockages in the water space just above the foundation ring in this area, and repeat on the other side. With the light now in the cab check the Registered Number of the boiler which is stamped just below the regulator stuffing box.

Using the 3" mirror in the hand hole and the acetylene light look up the flange of the back plate for grooving, common in copper boxes but not so in steel boxes fitted with correctly placed flexible stays. Large boilers have a plug half way up the flange which further assists inspection and most boilers also have a plug centre of the back plate at foundation ring level which can assist in checking that the spaces are clear. From the hand hole it can also be seen if there is any grooving just above the ring on the inner fire hole plate and after many years service it is possible to observe the commencement of cracks in the foundation ring along the rivet line.

If arch tubes are fitted they can be inspected by passing the light through the nipple and down the arch tube as far as possible looking for pitting along the bottom of the tube and using the 3" mirror a good look can be made of the stays across the top of the fire hole plate.

Electrolysis

Depending on the class of boiler there are usually two or three plug holes across the back plate level with the firebox crown. Slowly push the two foot length of light into each hole and observe the diameter of the crown stays, copper fireboxes had a minimum diameter of $\frac{1}{16}$ ". This wasting was due mainly to electrolysis. No pronounced wasting occurs in steel boxes but saucering can occur. Further inspection can be obtained by observation through the regulator stuffing box opening. Also the top flange of the back plate can be seen using the 3" mirror, again applicable to copper boxes.

Pass through the foot plate cab door and inspect the crown further through the plug holes along the sides of the outer casing and the nipple riveted to the radius of the casing. Use the small mirror to ascertain whether all the rivet heads are still on in the water side. Due to breathing of the boiler at this area the heads become fractured and drop off leading to leaks under test and at the same time look

to see if all the cross stays are in line and nothing is amiss.

Along the foot plate to the nipple on the leading barrel, push the light in as far as possible and you should be able to see the main steam pipe and some longitudinal stays and using the small mirror see if all rivet heads are there and if possible the pins and cotters in diagonal stays if fitted.

Past the smoke deflectors into the smokebox, firstly have your assistant put a kerosene torch in the plug hole centre of the throat just below the barrel. If not it is possible to give it a very good dip in the kerosene and work it up through the throat plate corner plug hole where the natural draft will draw the flame up to the tubes and you can look along the bottom of the barrel from the plug holes in the smokebox. Place the acetylene light in one of the plug holes in the smokebox and using the small mirror see all is clear between these holes since it is a common problem for masses of mud and scale to build up in this area and not be completely removed by the wash out. If all is clear look at the row of rivets holding the smokebox tube plate to the barrel angle ring and run your hammer around them. Any broken rivet should drop off and if this should occur take particular notice of this area when the test pressure is applied. Then around the smokebox door and down the other side reversing the procedure and when you come to the cab, there being no door this side you place your foot on the reversing bar and climb up on the crown. Look around the safety valves for signs of leaks at joints. On larger boilers fitted with syphons there are two inspection plug holes for each syphon, lower the light down as far as it will go and with your eye close to the hole observe the interior of the syphon.

The dome

The dome cover is usually placed on the crown so it can be turned over and observed if it is in good condition. Look at the dome studs to see if they are in good order, no necking due to blows of steam, and if the boiler has longitudinal stays it is impossible to gain ingress so it is a case of using the 6" mirror in conjunction with both the electric lead light and the acetylene light which when used in the various plug holes a full observation of the inside of the boiler above the tubes can be made. Look to see if injector delivery pipe clips are in good order since they are known to break off allowing the pipe to drop down and rub on the tubes eventually causing leaks. The main steam pipe is perfectly round and a thin main steam pipe can partially collapse under pressure which causes reduced steam supply to cylinders and poor steaming.

A 3/8" spring steel hook with a handle about two foot long was available to check the longitudinal stays. Hook it under each stay and give a pull to check if any are broken.

This is highly unlikely but they still must be checked.

In the larger boilers, the N(SG), X, S, R and H class it was possible to gain entry to the boiler since they had diagonal stays to the smokebox tube plate and back plate and if a surge plate was fitted to the dome it was removed to allow entry. With the electric lead light in hand you slide along on top of the tubes up to the combustion chamber tube plate and have a good look at the tubes where they enter the tube plate particularly at the prossering. See that all the cotters are in the crown bolt link pins and look for any other irregularity. Return to the dome and continue up to the smokebox end and sound the bottom of the main steam pipe with the stay hammer, practice teaches you if it is thin.

Firebox

Now to the firebox, enter through the fire hole with the electric lead light and firstly sweep the sides of the box with the light. Any bulges will be instantly picked up by their shadow, quite common in copper fireboxes. Again depending on its condition, the brick arch may or may not be removed but in boilers fitted with arch tubes or syphons, the centre row of bricks is removed to allow entry to the combustion chamber. Look for any signs of calcium at tell tale holes which is an indication that the stay has a fracture through to this hole and mark it with the yellow crayon for renewal. At this stage the assistant will commence to run the acetylene light up and down each row of boiler tubes for you to check if all are clear.

Copper fireboxes

In copper fireboxes look for burnt beads and worn ferrules while with steel boxes the edge of the bead where it is seal welded may be worn thin by the action of the cinders and cracks can develop. In the case of flue or super heater tubes radial cracks develop around the bead and continue to open up until they leak. Look just inside the tubes at the prossering area for commencement of leaks. It is surprising that rust scale will prevent leaks but once chipped away a hole is revealed.

Most of the problems relating to tubes are assessed in relation to the time the boiler has been tubed, how many miles the engine has done and when it is due in the workshops for retubing. Finally check the fusible plugs.

At all times while inspecting the boiler look at the condition of the threads and the number of threads in each inspection hole. With all the plugs replaced and applied in the correct manner, the mountings rejoined, the dome cover replaced, the method of sealing the joint between the dome angle ring and dome cover was by an annealed 1/4" diameter copper ring which fitted inside the dome studs.

As it was essential to use warm water to test locomotive boilers the location where tests were carried out had a locomotive type

boiler installed as a stationary boiler with the necessary pump and equipment to carry out the job.

Pumping water

In the early 1950s a fitter from a running shed came up with the idea that if a high pressure hose was fitted to the cap on an injector and the feed to the boiler closed, it was possible to feed the injected water into the boiler to be tested. This was a bit awkward with injectors on the back plate but was quite simple with the Nathan injectors below the cab, so the X, R, N(SG) and J classes became the testing locomotives. The test pressure was working pressure plus 25%. Taking an R class with a WP 205 psi the certificate showed TP 256 1/4 psi and it was always a joke on the foot plate while watching for the test gauge to rise to see if the 1/4 was there.

The pressure was maintained by releasing the surplus water through the blow down valve as an engine had no trouble raising the pressure 25% above WP, it was essential to keep a full tender tank of water. As soon as the test pressure was reached the Boiler Inspector, being on the foot plate, took the kerosene torch and passed it over all the plugs, hand holes etc on the back plate. If there was a leak the fine jet of water caused the flame of the kerosene torch to distort. He would then travel along the side and check all the plugs, into the smokebox for leaks in plugs, rivets and tubes before going down the other side to check the barrel angle ring, up on the crown especially around the safety valve mountings then along to the dome to see if it is sealed, down to ground level and check all around the foundation ring and the throat plate.

Back onto the foot plate and into the firebox look for tears in stays due to fractures and for leaks at tubes. When this is complete ask for the pressure to be dropped to 100 PSI and when this is reached sound the flexible stays. It is only after experience that a fractured stay can be found by the hammer. It is also necessary to know the construction of the boiler since the position of doubling plates, brackets etc will result in different sounds, as will a stay that has been renewed and a different tension from the original being applied. Any fractured stays are marked with the yellow crayon. In the case of copper fireboxes all the stays are sounded.

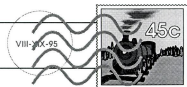
Due to the water being fed into the boiler via the injector the temperature in the firebox would be 66°C (150°F).

The certificate

On completion of the examination and test the "D" certificate was completed and if any repairs were required they were also noted on the certificate. The certificate was then signed by the Boiler Inspector and the Depot Foreman who eventually returned it to the Records Office.



Letter Box



"Boxes on Wheels" — reply

Sir,

Your editorial "To Steam or Not to Steam", AME Nov/Dec 1994, is considered to be interesting and appropriate comment in no way deserving the savage and insulting response it received. I will ignore the inane references to Tom Cruise and Elle.

With a fifty year association with miniature locomotives behind me I have seen the standard of workmanship improve to its present state of excellence. However, there are exceptions. Some of the live steam fraternity are quite capable of turning out a "Roughie" and some of their counterparts who belong to the wooden box, battery and starter motor on four wheels brigade have developed roughness into an art form.

Many of the diesel locomotives seen today are a delight and a credit to their builders. As for the "boxes on wheels", and they are exactly that, the thought persists that this is not the best that their builders can do, but all that they are prepared to do. If this is the case, why do they bother. The hobby does not need mobile rubbish. The voluntary work by AME editorial staff deserves better than heavy handed criticism.

John Austin
NSW

Praise to Oz supplier

Sir,

In these days when we are told to buy "Australian Made" products, I would like to comment on the following:

I am about to commence building my second Traction Engine and decided to purchase drawings, castings and gears, etc. from E. & J. Winter of Wallend, NSW.

The castings and gears are far superior to well known United Kingdom suppliers and the service was great! Mr E. Winter was most helpful in many ways, and prices were more than reasonable.

Jimmie Thompson
WA

Australian museum directory?

Sir,

I am inquiring whether a directory/publication exists of steam museums (static or live) other than railway, Australia wide, which are open to the public at regular intervals.

My knowledge of such is limited to those at Goulburn, Menangle and those mentioned in Dave Harper's Steam Chest column.

If not, could an article be done annually on this, detailing the individual engines or other machinery in a museum, together with brief technical specifications and other relevant information.

formation.

As a further suggestion, could consideration be given to making a video series on selected engine types in live action, in a similar fashion to those made by CMS Publications Ltd in the UK.

Stephen S. Davis
NSW

A publication called The 1995 Guide to Australian Tourist Railways and Museums is available for \$9.95 from the ARHS — NSW Division — 67 Renwick St. Redfern NSW 2016. This publication is updated annually... bmc

Open Forum — AALS reply

Sir,

The "Open Forum" on "The Big and the Small" in the July/August issue has certainly produced some interesting theories and solutions. I am not going to get greatly involved in this issue but I wish to correct one erroneous statement and throw in my opinion on the matter.

Mr Roberts states that the AALS recommended maximum speed is 8 km/hr. This is not correct as the current Codes of Practice state a figure of 20km/hr max. with 10km/hr average. This is the maximum allowed in the hobby unless of course an Inspecting Engineer and the Clubs committee can give good reason for higher and put their name on the bottom line.

Before some of you jump in and quote AS3533 Amusement Rides and Devices, I am aware that this says 10 km/h max. I won't go into the reasons that this occurred but hopefully this will be corrected when the revision committee meet in September. If not, we will continue to press for what was granted during the compilation of AS3533.

The problems with mixed gauges, in my opinion, only seems to occur when events such as the convention and club open days are held. Exactly why I don't know, especially when it does not appear to be a problem on the normal club running day. Maybe it is the relaxed atmosphere and good fellowship of the convention and open day that pull people into a false sense of security: as against the regular routine of the club running day.

Respect should be shown for the other's choice of scale and gauge. There will always be "the cowboys" in any group.

It is hoped that the introduction of the AALS Codes of Practice, and the Training Syllabi being prepared by the affiliated Societies, the current problems will be eliminated.

Barry Glover
President AALS

More on "Large and Small"

Ross Bishop-Wear replies to last issue's Open Forum... bmc

Sir,

It was very pleasing to see so many thinking people entering the large and small debate. Thank you all for your contributions in this regard.

I would like to take this opportunity to make some comments in reply to certain things that have been said, state a few facts and generally try to focus the debate on the real issues.

My background in this hobby for those that don't know me is long and diverse. I became productive at age twelve with stationery models, then completing a major rehash of a five inch steamer at sixteen; I actually consider this my first loco as the rebuild by nature was pretty extensive. Now at thirty three I am completing my eighth steamer having dabbled in NSW scale gear, narrow gauge, Blowfly types, a 7 1/4" gauge Black Five and 12" gauge as well. (Recall the article *Steaming in half full-size AME Nov/Dec 1993*). All the while travelling thousands of kilometers passenger hauling on many of the tracks both around Sydney and interstate. Additionally, my interest in steam has manifested itself in full-size restoration, marine and stationery machines and just about every other way of boiling water for pleasure that you can think of! I've also pursued numerous other side hobbies — far unrelated to this debate, so I won't bore you. So when I suggest that I am an unbiased person I really think you can take that as read.

The fact is the Ross Bishop-Wear (RBW) philosophy of life is simple: If you want to do something — *do it!* The only proviso being that it not be carried out to the detriment of others. My only desire is to see people enjoying what little time life allows for hobbies, and not waste it bitching at one another over issues that, with a little intelligence and diplomacy can be resolved.

My belief is that within the model engineering fraternity many different interests lie. This is good. The social aspect of the club environment is very positive and the diversity makes catching up with different people from time to time an absolute must.

Where I find two extremes of interests, generally speaking, is between the 5" "scale" guys and the 7 1/4" "get 'em going quick" guys. The five inch people have their share of these too but very often large 7 1/4" engines are a product of this thinking.

Now refer back to the RBW Philosophy, and if a great cab full of ball cocks with Mitre 10 stickers on them is what turns you on, then *do it*, and have as much fun as you can along the way! If screaming around in a cardboard

box with three wheels and a car battery is your idea of a thrill, then beauty, go ahead by all means. But, it is *selfish, unfair and antisocial* if your actions stop someone else from enjoying their precious hobby time as well.

You see, many people also get-off on building exquisite models. Their dedication and perseverance represents great commitment, both in personal time and resources which very often requires support and understanding from the whole family group. This is certainly true in my case. The achievements of these people are not to be scoffed at. These people are not tall poppies to be cut down. They deserve to be treated with respect equal to that of every other member of the hobby — however different their interests.

So the situation arises: that while "Mister Ballcocks" can't work out why someone would go to so much trouble building fine scale bits that get ripped of each time you derail. It is equally important for the pleasure of "Mister Fiddly Bits" to have the assurance that his engine and wagons will travel safely over the track, and that the product of his ten thousand hours work is not destroyed in a couple of seconds by someone else's negligence.

The most positive thing I've heard so far is the AALS resolve to place the onus on the individual society to deal with the problem in terms of the individual circumstances. It is in fact a club management problem. Things change. People's interests change. Survival comes from taking change on-board and working with it. For clubs, the charter is to accommodate the recent growth in preference for larger engines while still preserving the traditional interests at the same time.

I'm not calling for a split in the hobby. We are a minority group amongst the Australian population and unity is the key to our survival. However, the split is happening right in front of our noses — all by itself. At present you have club facilities that have been developed to cater for smaller engines and rolling stock being pressed to cater for the very large as well. The result, in many people's view, is that the needs of the large number of small engines have been compromised to accommodate a small number of large engines. The large brigade think they're being victimized for doing something different and the small guys feel their right to enjoyable running has been taken from them.

To bear this out, conversations I have had, reveal that the scale guys are carrying out risk assessment before turning out to events. Some events and locations are actually thought of as "not worth the risk". Now if that's not pre-empting segregation I don't know what is!

The nature of the problems created by combined running are well known. This is borne out by the letters published in the Open Forum last time. The challenge is to assess the facts and tackle the problem. The solution being *not to prevent* people from following their aspirations but to *accommodate* the

needs of the different interests without one diminishing the pleasures of the other.

In summary and in the wake of many discussions and comments in the Open Forum I believe the issues of contention are this:

- Safety due to lack of braking, caused by heavy engines running on a very narrow rail head.
- Safety due to lack of visibility from the cabs of the sit-in types.
- Safety due to the grave consequences of human error coupled with heavy weights.
- Diminished pleasure for small engine people due to risks of running with large engines behind.
- Diminished pleasure for the owners of scale engines and rolling stock due to rough multi-gauge trackwork.
- Diminished pleasure for large engine operators due to slow speeds of small trains and tight curves, etc.
- Are the objectives of the large engine people compatible with those of the existing small engine people?

Facts

Axle Loading

In 5" gauge the greatest axle load comes from the passenger cars. A conventional sit astride carriage carrying five average adults of 70 to 80 kilos each is 350 to 400 kgs over four axles, i.e. 90 to 100 kg axle loading. This is far higher than the engines that pull them. My latest engine is a 5" model of a 2ft gauge prototype, with extra weight built in wherever possible. It is a heavy engine; 210kgs on the scales, spread over three driving axles and one bogie. Axle loading is about 60kgs on a driving axle. Remember, the bigger the engine, the more axles it has to carry the load. Except in extreme cases axle loading is not a consideration in 5" gauge because even the largest of engines have a lower axle loading than the passenger cars.

In larger scales wanting to share track of flat bar rail with wide sleeper spacing you have a problem. There are 7/4" engines weighing 1000kgs on four axles and a bogie, bringing the axle loading to over 200kgs each. Engines weighing 500kgs having only two axles brings it to 250kgs per axle.

Now it is really worth considering how your existing track will cope. The big engines are okay because they have long spring travel, deep flanges and forgiving clearances. The question is: will the fine scale gear continue to enjoy safe running or will these people be penalized by allowing the track to deteriorate under the influence of larger engines? Remember: do what you want, but not at the expense of others!

Narrow Gauge

You could be forgiven for thinking I have ulterior motives here, for most of you will perceive my new Fowler as *big*. It is physi-

cally large and heavy. It probably represents the upper-end of size for 5" possibilities, as there are not many prototypes less than two foot gauge! However, if you boil these types down to the essentials they are basically hot air. The big cab is nothing, the frame is heavy but no heavier than the heavy plate ones being used on cast frame prototypes these days, the cylinder dimensions are the same as an 1 1/4" scale C38 class, the driving wheels only 6" diameter and the boiler not much different in capacity to a 38 either. So before you let first impressions convince you that a narrow gauge engine is *so big and so heavy and so powerful*, determine the facts and you will find that in 5" gauge, two footers are not all that much different in terms of weight power, etc., than some of mainline engines on the track. This is not true of larger gauges due to the exponential relationship of size and mass. Mass being directly related to volume which is a cubic quantity which increases in all directions. Double the size is eight times the mass!

Wheel Standards

Why we have more than one standard wheel profile on the same gauge is beyond my powers of reason. The purpose of standardizing the profile — particularly the flange and back to back — through AALS was to give us all the enormously valuable benefit of being able to visit each other's clubs and run on standard trackwork. My narrow gauge efforts all have a non-scale wheel profile. That is, the wheel has a smaller-than-scale flange which actually complies with the AALS standard for 5" gauge fine scale. It would follow that large narrow gauge engines in 7/4" should have the same profile as the mainline 7/4"ers and if that is not adequate to keep them on the track, then they really should be on a different track more suited to their needs.

Focus the Debate

The debate therefore, should not concern itself with narrow gauge versus standard gauge prototypes. Nor should it question the validity of a person's preference for large or small. Things change and people we have all been friends with for years have progressed to different things for the same reason; to have fun.

The issue is simply: what is the most practical way of catering to the needs of fine scale equipment in 5" gauge, requiring precision trackwork, narrow flange gaps and peace of mind for the owner, and, on the other hand, large-size engines requiring more substantial rail and civil works, greater clearances in trackwork and the desire to pursue the pleasures without the liability of the "nonsensical scale boys".

It's like riding your push bike on the Hume Highway; the safest solution is trucks on the Highway, bikes somewhere else!

Hoping to continue this interesting and productive discussion.

Ross Bishop-Wear
NSW



Product Reviews

The Stirling Engine Manual

I mentioned this book briefly in the News Desk of the previous AME. Having read the book from cover to cover, I am sure this book will be a best seller on hot air engines!



Fig 1.1 Stirling's Hot engine, 1826 (after Dr A. J. Orgen).

This hard cover book is A4 size with 189 pages of text plus end pages. There are 12 colour photos on four centre pages.

Before I discuss the book further, go and order a copy, then come back and finish reading this review.

I have only had a small exposure to hot air engines, so I am not really conversant with hot air terminology (although many would argue I am a lot of hot air!). Having studied this manual I feel a lot more confident in discussing this alternative-to-steam side of the hobby.

My only criticism is the order of the first two chapters. Chapter one: *What is a Stirling Cycle Engine?* Is devoted to the historical aspects and the development of this type of en-

gine. Chapter two: *How the "Closed Cycle" Hot Air engine works.* Discusses the technical and operational processes of the engine. For someone like me — not familiar with the hot air terms — I found chapter one hard going because I had no idea what it was talking about. I eventually gave up and read chapter two. Armed with new-found knowledge, I reread chapter one and suddenly realized what the author was saying! If the book is republished in the future, they might consider putting the subject matter of chapter two first.

The book is well written, with lots of helpful diagrams, charts, and photos to help the learning process. I had no idea there were so many variations of these engines. You can even make a solar powered version.

This is the second book on Stirling engines by James Rizzo. His first, *Modelling Stirling and Hot Air Engines* published in 1985 by Patrick Stephens Ltd has sold out! Camden Miniature Steam Services have republished James' work by taking the original text, and with James' help, updated the information and included new designs.

The *Stirling Engine Manual* is aimed at beginners, it uses simple terms and easy to

follow directions. The advantage of this book is that it gets you started — with 13 models to build — then supplies you with enough information to develop your own. The Stirling engine has plenty of scope for experimentation and is yet to reach its full potential. Many model engineers enjoy a challenge, this is a good place to start!

It is important to record the value of experiments. The final chapter, 23, *How to measure engine performance*, shows you how to determine your engine's speed, torque, power and power pressure.

Every aspect of Stirling engine construction is covered by this world renowned authority on sterling engines. James Rizzo has put a lot of effort in this production and it is worth every penny!

Price: £23.95 surface mail, £32.45 air mail. Including post and packing.

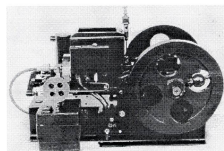
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Brian Carter

The Rowville Engine



Live Steam Supplies sent along a construction manual of Peter Bucknell's latest project — *The Rowville Engine*. It is a book outlining the fabrication of a half-size engine based on a *Hercules* farm engine, a water-cooled four-stroke petrol engine.

The book is A4 size, plastic spiral bound, with 36 pages of white bond paper and a buff coloured card front and back cover.

The engine type represents an important part of the evolution of Australia's power systems. It is a general-purpose engine used in country areas as a power source for pumping water, sawing timber, cutting chaff, etc. That should be enough reason to motivate a possible constructor.

I had the pleasure of visiting Peter and his workshop while I was in Melbourne for the 1994 Model Engineering Exhibition. The Rowville Engine was under construction at the time.

I am sure this book will appeal to many modellers of non-steam equipment. With this in mind it is important to point out some of the features that may cause inexperienced modellers some concern. Actually, I would strongly recommend that this particular project is attempted by very experienced Fitting and Machining tradespersons only! Or at least an experienced model engineer with a very good fitter friend! The book was not written with beginners in mind, it makes too many assumptions and many important, minor details and explanations are left out.

Although there are kits with castings available for a hit-and-miss engine in different scales, Peter prefers the fabrication approach. His use of the gas axe (oxy acetylene cutting) and "stick" welder are a major feature of the construction. The construction description is written in newspaper headline style, i.e. very short on pronouns, adverbs and the definite article! Generally speaking, the text description does not flow well, although it does describe the methods of very good construction techniques that could be used in other applications. A tradesperson would be able to work out what Peter is alluding too. The story would have benefited from a couple of technical people reading the typed text, it seems that the typist had trouble with the handwritten transcript. For those who purchase the book, allow me to interpret some of the typo's: jib head key = gib head key; No.2 mouse shank = No.2 Morse shank; unbreak'o = Unbrako. I must confess I am curious how you would bore a 65mm hole in a 100mm x

12mm flat bar as suggested on page 3. I tried to work it out from the "plans" but I couldn't.

The front cover states "including plans", I would use the word "plans" figuratively in this case. They are really rough near-freehand workshop sketches. The dimensions and descriptive text are hand written and, in many instances, difficult to read. They appear to be photocopies of Peter's construction roughs. The drawing style will be difficult for a non-fitter/draftsperson to interpret. Many lines that really need to be there are missing.

The photographs are very dark, lack contrast and do not show a lot of detail. The captions are far too brief. A photo caption on page 12 says *Making tools*, the photo shows tools and the items made with the tools. It doesn't say which tool is used for what, or which is a tool and which is not!

The book has potential in its present form but it would be an excellent resource, even for beginners, if it was re-edited and the drawings produced in a professional manner.

While the above appears to be a severe criticism, I think the project has a place in the model engineering arena. Because of this, it is also important that you are aware of the possible problems you may encounter if you undertake the project.

Price: \$35.00 plus post and packaging

Available from: Live Steam Supplies

26 Cnr Durham and North Roads, Kilsyth, Victoria, 3137. Phone: (03) 9723 9722

Brian Carter



News Desk

Compiled by Brian Carter

Derailements

OOPS! Yes I do need glasses, and now I have them I might not repeat the effort where I managed to wipe out everyone's phone number from the crew list. Poor Murray Lane, our long time New Zealand Representative, vanished completely. I have fixed the problem now, so it shouldn't happen again. I won't say it will never happen again because, after all, this is being produced using a computer to lay out the pages!

A minor error occurred when I quoted the wrong price for Ken Tinkler's *Miniature Live Steam in Australia* directory. The price is \$7.95 posted, not \$8.25 as mentioned in the review. Now that it is even cheaper than you thought, make sure you order one from 79 Rowans Rd. Moorabbin, Vic. 3189.

You'd think I would get my own club's annual steam fest date right! The HDMS invitation weekend is actually on 6, 7 and 8 October.

On page 17 of the last issue, centre right photo. Barry Glover is on the left!

I apologize to those affected.

422 series

Due to the author's commitments in the real world (work and family), the article preparation for this issue has suffered a derailment. We hope to be back on track for the next issue.

An update on the movements on the full-

Small Gauge Revival from page 44

The inner-person was well catered for, with a barbecue on the Saturday evening and bottomless cups of tea or coffee right through the weekend. As usual our ladies did a first-rate job in looking after the tea-and-biscuits department.

Altogether, the Small Gauge Revival, while it did not achieve its main objective of bringing out operational 2½" gauge locomotives, must be regarded as most successful. The oft-heard comment was "When is the next one?" and this will certainly happen, probably every second year. Finding a suitable date is not easy, with the need to avoid clashing with other events, especially the AALS Easter Convention. Our club enjoyed putting on the event and certainly look forward to doing it again.

Finally, thank you to all those who attended and not least, well done and many thanks to organisers John Auty and Frank Clark, and their team of willing helpers, without whom the whole thing would not have happened.



size 422s. As well as the occasional metropolitan and South Coast workings, the old workhorses are still running on the Main South line in numbers. Workings out of June and Cootamundra as well as Albury are common.

They continue to defy their age with fast runs when called for. In May this year there were regular sightings of the class in Victoria, working the high-wheelers, usually in-the-shafts with a V/Line C class.

Typically: 5 May saw C510 + 42210 work straight through from Melbourne to Sydney. On 26 May C502 + 42217 were seen hammering through Chiltern with a Brisbane-Melbourne freighter in tow. (ARHS Bulletin - July 1995 issue).

Club visits

If you are visiting other clubs, at any time, with or without a loco, it would be a good idea if you tell your club administration first. This may help your "insurance cover" by making it an "official club event".

Help — thanks

We had a few readers offer assistance with our subscription database. It is nice to know that you care about your magazine.

It might be pushing the friendship, but no one offered help with advertising follow-ups. I could really use some help. Another job has become vacant, we need someone to collate and type news from the club newsletters for the Club Roundup. It's a good way to catch up on all the gossip!

Email

Don't let it be said that AME doesn't keep up with the times. For those who have access to electronic mail, I can be reached at either of two addresses:

carterb@mackie.edfac.usyd.edu.au
or: brian.carter@f628.n712.x3.fidonet.org

It's an easy, and sometimes almost instant, way to communicate on a global scale.

Stolen models — UK

For your information, in case these models end up on the Australian or New Zealand market.

Myke Baigent, a leading member of the Guildford Model Engineering Society UK, has had three rare miniature engines stolen. Derek Webber from the same society has one model stolen, a dark blue Petrolia. Myke's engines are: *Jenny Lind*, a 2ft 6in long 2-2-2 cables loco, with six-wheel tender, of the 1840s period. It is painted mid-green with black running boards and brown underframe and buffers. The second model is *Rainhill*, a bright yellow Stephenson's Rocket look-alike, about 2ft long. The model has a four-wheeled tender and a wooden veneer-clad boiler with

pencil planking lines. The third model is an 18in long, 1in scale, pre-war built *Model Engineer* traction engine. It is dark green with cream and white lining. It was built by Myke's Father and has the words "M. Baigent 1938" on the smokebox door.

If you see or hear about any of these models, contact AME and we will get in touch with the owners for you.

Contact lenses and welding

Following an article in AME Sept-Oct 1994, page 16, where it was stated that contact lens wearers are in no danger while welding. A reader, J. Bowman, sent in a note drawing our attention to an editorial comment in *Model Engineer*, 18 August 1989, where a shipyard worker was blinded when large areas of dried cornea came off his eyes when he removed his contact lenses after receiving a flash. According to the *Model Engineer* comment, the worker was not welding when this occurred. He was connecting welding cables on a 440 volt supply and received a flash when he opened the circuit breaker. That kind of flash may have blinded him even without contact lenses!

The AME article was taken from *The Australasian Welding Journal*. The content was a report by Brien Holden, Associate Professor of Optometry at the University of NSW and Director of the Cornea and Contact Lens Research Unit. As was stated at the end of the AME article, if you wear contact lenses and you would like more information about when and where contact lenses should and shouldn't be worn, call the Welding Technology Institute of Australia (WTIA) on (02) 748 4443.

Trade and commercial

Scobie & Glover have some new products available: **Item 1** is a standard five-chime whistle suitable for 1½" scale locomotives. It comes either as a set of five castings plus assembly instructions for \$25 plus P&P. Or machined ready to paint at \$50 plus P&P. This kit is a non-working accessory. **Note:** the error with the bell section on the 5" gauge version has been corrected and the five chambers now have the correct angular displacement. **Item 2** is a set of cast Step Treads for use on the 422 class plus other engines. It comprises a set of 12 Castings at \$12 plus P&P.

Live Steam Supplies have a new address: 26 Cnr Durham and North Roads, Kilsyth, Victoria, 3137. Phone: (03) 9723 9722

E. & J. Winter have some O gauge and 2½" gauge live steam kits available if you feel like a small project: in case there is another "Small gauge Revival" in two year's time.



Classifieds

Traditional English Traction Engines

- Drawings, castings, accessories for 3" to 6" scale. Complete boilers supplied with pressure certificate. Machining and gear cutting service available. Send £5.00 sterling (or alternately quote credit card number and date of expiry) for catalogue and price list to: Live Steam Models Unit 7, Old Hall Mills, Little Eaton, Derbyshire. DE21 5DN U.K. Phone: ISD+44 1332 830811 Fax: ISD+44 1332 830050

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Phone (02) 744 5440

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- Now available at competitive prices. **Mail Order Only** Send two 45c stamps for price list to: A-Head of Steam, PO Box 3, Wamberal NSW 2260. Phone/fax: (043) 34 2538.
Also see display ad on page 7 of this issue.

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Information on Spanish Railway's "Talgo" gauge changing system. Plans, Photographs, Descriptions, etc. greatly appreciated. Expenses cheerfully refunded. Please Phone Trevor (07) 3890 3079

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- \$3.50 per line as published (including heading). As a rough guide, count 58 characters per line (including spaces and punctuation). No limit to the number of words.

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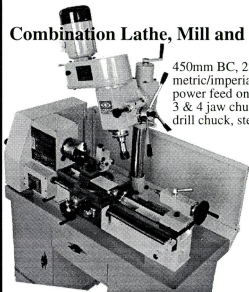
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- Maximum of twenty words, including your contact name, phone number or address.
- Posted, on special form provided. No faxes please.
- 5" gauge or larger locomotives (for sale) are not eligible.
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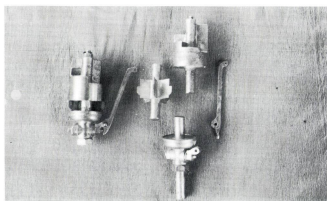


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Saturday 11th November 9.00am - 4.30pm

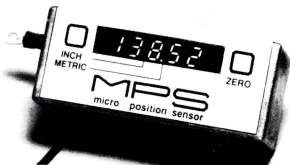
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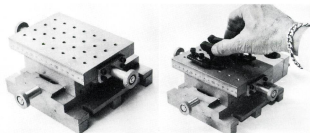
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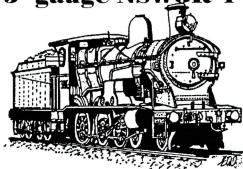
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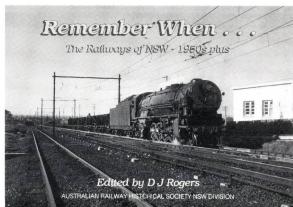
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